

Chapter 4: Environmental Consequences

4.0 Introduction

This chapter addresses the probable beneficial and adverse social, economic, and environmental impacts of the alternatives considered for the Southern Corridor. Impacts on resources and the measures to mitigate them are presented in this chapter by alternative. If there are no mitigation measures listed for a resource in this chapter, then none were required.

Indirect Effects on Development. NEPA requires that the indirect effects of a project be evaluated and included in a list of overall project impacts. Indirect effects are defined as effects caused by the project that occur later in time or outside the project footprint area, but are reasonably foreseeable. Indirect effects can include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and the related effects on air and water and other natural systems including ecosystems. The indirect effects of a highway project are primarily from land development that might occur near the highway after it is constructed.

However, the Southern Corridor is proposed in a region where development is already occurring and where future development is planned by all local jurisdictions. As noted in Chapter 3, Affected Environment, population and economic growth during recent years have driven ongoing development, and demographic forecasts from the Utah Governor's Office of Planning and Budget indicate a continued high population growth rate. The development to support this continued high, non-project-related growth will affect the natural resources in the study area whether or not the Southern Corridor is built.

Development Type and Timing. Consultations with local planners and city officials during the Southern Corridor Committee (SCC) meetings indicate that the ultimate growth patterns, planned land uses, and impacts to the environment would be similar whether or not the Southern Corridor is built. However, the timing and type of development around the Southern Corridor interchanges would likely be different if the Southern Corridor were not built. The Southern Corridor would be built in phases to support the expected growth, first as a two-lane road and eventually expanding into a limited-access highway when traffic warrants. However, once initial construction is completed, it is likely that some development near the roadway would occur sooner with the Southern Corridor than without it. It is expected that the area around the interchanges would

develop by about 2010 (after the Southern Corridor and St. George Airport are built) compared to 2020 under the No-Build Alternative.

No-Build versus Build Alternatives. To evaluate potential impacts, assumptions were made on how the road network and land uses would develop differently between the No-Build and build alternatives. To develop the No-Build Alternative, meetings were held with community representatives and city land use and transportation planners to project the future No-Build Alternative road network and land uses. Chapter 2, Alternatives, provides an overview of the different alternatives and depicts the No-Build and build alternatives road network.

Table 4.0-1 provides an overview of the difference between the No-Build and build alternatives in actual acres of major new roadways. (Changes in land use are discussed in Section 4.1, Land Use Impacts.) Overall, discussions with the local communities concluded that the road network and land uses would not be substantially different under the No-Build Alternative compared to the build alternatives. The difference in the road network, other than the Southern Corridor, is that many roads under the No-Build Alternative would need to be wider to handle traffic that would have used the Southern Corridor.

Table 4.0-1. Acres of New Roadways, No-Build and Build Alternatives

Roadway	No-Build Alternative	4300 West Alternative	3400 West Alternative	2800 West Alternative
Southern Corridor	NA	675	735	928
Other major local roadways developed ^a	400	150	150	150
Total	400	825	885	1,078

^a Major roadways that the cities might develop to support future development. Acres include new roadways and new lanes to existing major roads. This information is based on discussions with local cities and does not include minor roads.

Most of the changes in land use resulting from development in the project area are expected to occur in the urbanized areas of Washington County including St. George, Washington City, Hurricane, Santa Clara, Ivins, La Verkin, Virgin, and Toquerville. In this urbanized area, about 27,700 acres have been developed and 84,700 acres are available for future development. This area available for development is expected to be developed by the 2030 planning period.

Cumulative Impacts. This chapter also analyzes the potential cumulative effects to the environment that could be associated with building the proposed Southern Corridor in conjunction with past, present, or reasonably foreseeable future actions. Specifically, the cumulative impact analysis has been prepared according to the requirements of NEPA and guidance from the Council of Environmental Quality, *Considering Cumulative Effects under the National Environmental*

Policy Act (CEQ 1997). The CEQ regulations implementing the procedural provisions of NEPA define cumulative effects as:

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7).

CEQ guidance recommends that the cumulative impact analysis focus on truly meaningful effects. Therefore, this EIS evaluates only cumulative impacts on those resources with the potential for truly meaningful effects. Most of the potential cumulative impacts in the project area would be associated with growth that will occur in the region and the change of land use from open to developed. This growth and change in land use would occur with or without the Southern Corridor, although the types of land use would be different. The increase in growth and change in land use could result in cumulative impacts to noise, air quality, and habitat for threatened and endangered species as the area is developed.

Additionally, cultural resources could be lost due to development. Therefore, the resources analyzed for cumulative impacts in this EIS include land use, air quality, noise, wildlife habitat, threatened and endangered species, and cultural resources. Potential cumulative impacts are analyzed under each of these resource sections. No cumulative impacts are expected for the other resource areas addressed in this EIS.

For each resource noted above, a geographic boundary is defined for the cumulative impact analysis along with a timeframe. Potential past and future actions considered in the analysis include growth/development in the region, the proposed St. George replacement airport, other transportation projects, BLM management activities, and the Sand Hollow Reservoir. The information for these actions was obtained from BLM; local, county, and state governments; and private developers.

4.1 Land Use Impacts

Section 3.1, Land Use, presents current and projected land use on the city, county, and regional levels. This section summarizes the results of the analysis of the proposed project's potential impacts on land use. Potential impacts to natural resources from land use changes are analyzed under each specific resource area (for example, threatened and endangered species).

4.1.1 Impacts on Cities and County Land Use

4.1.1.1 No-Build Alternative

Meetings were held with local officials and city planning officials to determine how the project area would develop under the No-Build Alternative. With the No-Build Alternative, the study area would change from its current primarily rural character to a more urbanized, developed nature. Lands currently zoned for open space and agricultural use are anticipated to develop into areas more concentrated in population with residential and commercial uses and less open space.

This change would occur because the population for the cities of St. George, Washington City, and Hurricane is increasing, and all of the identified land use plans anticipate growth and development in the Southern Corridor study area. St. George and Washington City anticipate annexations of land in the study area (Maynes 2001; Nicholson 2001). Provided below is a summary of the No-Build Alternative's effect on future land use plans for St. George, Washington City, and Hurricane.

St. George. Figure 3-3, St. George Land Use, shows the land uses that would occur with the Southern Corridor. The City of St. George has stated that, under the No-Build Alternative, land uses and the growth expected would be similar to the build alternatives. Because much of the downtown area has been developed, and in keeping with the character and desires of the community, the city is expected to continue to grow to the south toward the Arizona border. This growth would result in the open land use being converted to residential, commercial, industrial, and mixed uses in the future.

Figure 4-1, St. George Land Use Map, No-Build Alternative, shows the changes in land uses under the No-Build Alternative compared to the build alternatives. The main differences are that the commercial area planned east of the replacement airport would not be developed and would remain open space. The land use around the two north-south access roads would change from residential to commercial, and the planned industrial development in the south part of the city would change from industrial to residential. Since there would be no interchange at I-15 with the Southern Corridor, this area would change from commercial to residential in nature.

Washington City. Figure 3-4, Washington City Master Land Use Plan, shows the land uses that would occur with the Southern Corridor. Discussion with Washington City determined that the land uses would be similar under the No-Build Alternative since the Southern Corridor does not use city land. Under the No-Build Alternative, it is expected that the land use along Washington Dam

Road would stay more residential in nature. Washington City expects that most of the agriculture and open space land uses in the city would be developed into low-density residential in the future under the No-Build Alternative.

Hurricane. Figure 3-5, Hurricane City Future Land Use Map, shows the land uses expected under the No-Build Alternative since the future land use plan for the city does not include the Southern Corridor. The land use plan shows that Hurricane would continue to develop to the south, converting open space and agricultural lands to mostly residential uses. There would be some commercial uses along the major roadways.

Indirect Land Use Impacts. Indirect land use impacts under the No-Build Alternative include the southern part of the study area changing from open and agricultural land uses (grazing, farming, and recreation) to urban uses. The changes in land use would be similar to those described under the build alternatives. It is expected that the rate of growth would also be similar because the population will increase by the same amount under any alternative.

The main difference is that land development would occur to the south toward the Arizona border and might not result in the “leapfrog” development that could occur with the build alternatives. These changes in land use would result in fragmentation of wildlife habitat, changes in water quality, impacts to threatened and endangered species, and impacts to other natural resources in the study area. The specific impacts are analyzed under each resource section.

4.1.1.2 4300 West Alternative

Construction of the Southern Corridor would be through mostly undeveloped desert and would convert open space into a highway. As with the No-Build Alternative, the character of the land uses under the 4300 West Alternative would change from the existing rural uses to more urbanized uses, because transportation improvements and the expected growth would contribute to a more intensely developed environment than what currently exists.

Community planners from Washington County and the cities of St. George, Washington City, and Hurricane indicate that current development patterns would not change substantially as a result of constructing the Southern Corridor (Geoheen 2001; Maynes 2001; Nicholson 2001).

St. George. Figure 3-3, St. George Land Use, shows the expected future land uses under the 4300 West Alternative for St. George. The study area would change from open land uses to residential, commercial, industrial, and mixed uses. The area in the southern part of the city might develop faster with the Southern Corridor.

Washington City. Figure 3-4, Washington City Master Land Use Plan, shows the land uses that would occur with the Southern Corridor. Washington City expects that most of the agriculture and open space land uses in the city would be developed into low-density residential uses in the future under the No-Build Alternative. The area around Washington Dam Road might develop faster and more commercially with a connection to the Southern Corridor.

Hurricane. Figure 4-2, Hurricane City Future Land Use Map, Build Alternative, shows the expected future land uses with the Southern Corridor. Discussions with city planners stated that the land uses would be similar to those under the No-Build Alternative except that the land next to the highway would become commercial/industrial instead of residential.

Indirect Land Use Impacts. Indirect land use impacts under the 4300 West Alternative include the southern part of the study area changing from open and agricultural land uses (grazing, farming, and recreation) to urban uses. Building the Southern Corridor would likely result in land uses changing from open to developed at a faster rate near the highway once it is constructed. The City of St. George is planning for the Southern Corridor and promoting more mixed land uses that would not require residents of the area to travel to reach services. It is expected that the rate of growth for this alternative would be similar to the No-Build Alternative because the population will increase by the same amount under any alternative.

The above changes in land use would result in fragmentation of wildlife habitat, changes in water quality, and impacts to threatened and endangered species and other natural resources in the study area. The specific impacts are analyzed under each resource section.

Indirect Impacts of Interchange Number and Locations. About 10 interchanges have been initially identified by the cities to satisfy the expected development. However, the exact number of interchanges would be identified by the cities and approved by UDOT as growth occurs. The number of interchanges along a highway affects how growth occurs and the density and type of land use. Fewer interchanges could reduce the type and density of growth in certain areas. The cities could use interchange placement as a tool for managing development and minimizing environmental impacts. By minimizing the number of interchange locations, habitat for endangered plant species in the project area can be protected and the highway itself could be used to protect areas of critical concern. Overall, the placement and number of interchanges requested by the cities could reduce habitat fragmentation, minimize impacts to threatened and endangered species, and maintain more open space. Before interchange locations are selected, a thorough analysis of the surrounding environment and the use of

smart growth strategies should be considered so that the environmental quality of the area can be maintained (see Chapter 6, Smart Growth).

The current open land use around the proposed interchange locations would develop faster than the noninterchange locations and would most likely become commercial. The number of proposed interchanges under this alternative would likely result in most of the land north and west of the Southern Corridor changing from open to developed land uses. The City of St. George has developed a land use plan that includes potential interchange locations and shows land use consisting of mixed residential, business park, and commercial. Other interchange locations in Washington City and Hurricane would likely result in commercial uses.

4.1.1.3 3400 West Alternative

The direct and indirect impacts from the 3400 West Alternative on the cities and county would be the same as those for the 4300 West Alternative, except that this alternative might affect the planned Outlaw Ridge residential development in Hurricane. This development would be segmented by the highway, which would decrease the total size of the development parcel (Hall 2001).

4.1.1.4 2800 West Alternative

The direct and indirect impacts from the 2800 West Alternative on the cities and county would be the same as those for the 4300 West Alternative.

4.1.2 Consistency with Plans and Policies

Numerous documents contain plans and policies regarding the development of land in the general study area. The Southern Corridor is specifically identified in several of these documents, including the St. George Planning Department's Land Use Plan Map; the South Block Property, St. George, Land Use Plan; the Washington City General Plan; and the Coordination Plan for Washington County's Urbanizing Region. The Southern Corridor is not explicitly identified in the Washington County General Plan Map or the Hurricane City Future Land Use Map.

The specific consistencies or inconsistencies of the alternatives with city and county land use plans are described below.

4.1.2.1 No-Build Alternative

The Washington County General Plan Map and the Hurricane City Future Land Use Map do not include the Southern Corridor. Therefore, they would be consistent with the No-Build Alternative.

The Southern Corridor is identified as part of the land use plan for the City of St. George. The roadway would serve as a primary arterial to new development, which would include a new airport, town center, commercial area, residential area, and lands designated for open space (Ward Engineering Group 2000). These plans are inconsistent with the No-Build Alternative.

The Southern Corridor is identified as part of the land use plan for Washington City. The roadway would be located near areas that are changing from open space to new low-density residential areas (Chong and Associates 1997). These plans are inconsistent with the No-Build Alternative.

The Southern Corridor would be consistent with most land use plans for the general study area and overall would not require major revisions of any of the land use plans.

4.1.2.2 4300 West Alternative

This alternative would be consistent with all land use plans for St. George and Washington City.

The 4300 West Alternative would be consistent with the *Coordination Plan for Washington County's Urbanizing Region*, which is a regional planning document developed with input from land use plans for Washington County and the incorporated areas in the county. The plan indicates that the Southern Corridor could be justified if planned development occurred south of St. George (Winston Associates, Inc. and others 1997).

Although the Southern Corridor is not identified in the Hurricane City Future Land Use Map, the general consensus of the citizens of Hurricane is that the Southern Corridor would be a beneficial project, since the Southern Corridor would provide access for drivers who want to bypass SR 9 and I-15 (Hall 2001). Subsequently, coordination with city officials from Hurricane and UDOT could make the Southern Corridor compatible with the land use plans for the City of Hurricane.

4.1.2.3 3400 West Alternative

The impacts from this alternative on the plans and policies of the cities and county would be the same as those for the 4300 West Alternative.

4.1.2.4 2800 West Alternative

The impacts from this alternative on the plans and policies of the cities and county would be the same as those for the 4300 West Alternative.

4.1.3 Cumulative Impacts

Potential cumulative land use impacts could occur with the development of the Southern Corridor in the southern part of Washington County. This area is where growth is expected in the next 20 to 30 years. The geographic scope of this analysis is the urbanized areas of Washington County, which include St. George, Washington City, Hurricane, Santa Clara, Ivins, La Verkin, Virgin, and Toquerville. Changes in land use can affect how environmental resources such as threatened and endangered species would be affected as an area changes from undeveloped to developed. Specific cumulative impacts from changes in land use to individual resources such as noise and threatened and endangered species are discussed under those resource sections in this chapter.

Modern development in Washington County was begun by Mormon settlers in the 1800s. The character of the area remained rural until the 1970s, when the land use began to change from open and agricultural to more urban. The main cause of this change was the population growth the area, mostly from retirees moving to the warmer climate of southern Utah from northern Utah. This population growth caused about 27,700 acres of the 1,556,000 acres in Washington County to be converted from desert to urban. This acreage is the baseline for the land use cumulative impact analysis. The trend is for developable private and state lands to continue to develop as population increases.

Table 4.1-1 shows the amount of future developable land available in the county, including the urbanized area. It is expected that much of the developable land in the urbanized area that is currently open space or agricultural (about 84,700 acres) will be developed in the next 30 years. This development would include residential, commercial, industrial, and mixed uses. The remaining available developable land in the county (about 225,300 acres) is about 15% of the total land area (1,556,000 acres). The Southern Corridor would directly contribute less than 1% of the land area being changed from open to developed.

Table 4.1-1. Cumulative Land Use Impacts, 1995–2020

Land Type	Area (acres)
Washington County	1,556,000
Undevelopable or constrained land ^a	1,219,000
Existing developed areas	27,700
Land available for development in county ^b	225,300
Land available for development in urbanized areas ^c	84,700

^a Includes federal (BLM, Forest Service, National Park Service, Indian reservation lands) and physically constrained lands (such as floodplains and steep slopes).

^b Includes all developable land in the county including urbanized areas.

^c Urbanized areas include St. George, Washington City, Hurricane, Santa Clara, Ivins, La Verkin, Virgin, and Toquerville.

Source: Geo/Graphics, Inc. 1994

Much of this anticipated growth has been included as part of the local cities' land use plans. The change in the area from semirural to urban is expected under both the No-Build and build alternatives. Based on these plans, Table 4.1-2 provides an overview of the expected land uses that could occur in the urbanized area of Washington County under both current plans (conventional development) and if the cities implemented smart growth strategies. For more information on smart growth strategies and implementation measures, see Chapter 6, Smart Growth.

Table 4.1-2. Future Land Uses

Land Use	Conventional Development (acres)	Smart Growth (acres)
Residential	38,107	27,818–33,534
Industrial	9,315	9,315
Commercial	4,234	4,234
Roads/highways/parking	23,171	15,878
Open space/wildlife habitat	11,856	21,722–28,068

The conversion of open space and agricultural land to urban uses would reduce habitat for wildlife and threatened and endangered plant species and would affect other resources such as water and air quality. These effects are analyzed under each specific resource section.

4.1.3.1 Recommendations for Minimizing Cumulative Impacts.

EPA, FHWA, and UDOT have been working with St. George, Washington City, and Hurricane to address potential cumulative impacts that could occur from growth and associated land use changes in the next 30 years. For example, EPA has provided a grant to the City of St. George to look at alternative land uses and

how they affect the environment. Additionally, meetings have been held with the cities to discuss smart growth land use and the benefits to the environment and the community. Chapter 6, Smart Growth, details some of recommended land use strategies that could minimize long-term and cumulative impacts to air and water quality, wildlife habitat, noise, and other important resources.

4.2 Farmland Impacts

This section addresses impacts on farmland, including prime, unique, and state-important farmland. Farmland impacts were evaluated based on information from an NRCS soil survey of the Washington County area and field surveys along the alignments.

Indirect impacts would be similar to those for the No-Build Alternative. The prime, unique, and state-important farmland would likely be developed under any alternative. Although the timing and location of development could be different if the Southern Corridor is built, future land use plans show most of the area within the local cities' boundaries being developed in the next 25 years.

4.2.1 Prime Farmlands

4.2.1.1 No-Build Alternative

Under the No-Build Alternative, prime farmland would be converted with the construction of local roads. Construction of a road at 3400 West by the City of Hurricane would likely result in some impacts to farmlands (less than 10 acres). Other impacts to farmlands could occur with the widening of Washington Fields Road, which would provide access to the St. George replacement airport. The overall impacts from the local road network would likely be similar to the build alternatives.

Indirect impacts to farmlands from growth would result from development planned in the urbanized areas of Washington County as agricultural land is converted to nonagricultural uses. The future land use plans for St. George, Washington City, and Hurricane show no agricultural land remaining within the city limits. The exact amount of land currently being farmed in this area is unknown, but is probably small because it occurs within the limits of cities that are expanding. Most agricultural land is located along Washington Fields Road in Washington City and in the southeastern part of St. George.

4.2.1.2 Build Alternatives

Table 4.2-1 summarizes by alternative the direct impacts on prime farmland soil. Figure 4-3, Prime and Unique Farmland Impacts, shows the location of each alternative relative to prime and unique farmland. The impact numbers were calculated using a 300-foot ROW.

Table 4.2-1. Impacts on Specially Designated Farmland

	4300 West Alternative (acres)	3400 West Alternative (acres)	2800 West Alternative (acres)
Prime farmland	0	50	0
Unique farmland	1	0	0
State-important farmland	0	0	0
Total	1	50	0

USDA's AD 1006 Farmland Impact Rating Form was used to evaluate the impacts of each build alternative on prime, unique, and state-important farmland. The main criteria used for this rating are total farmland acreage to be converted, percentage of total acreage in the county or city to be converted, degree of nonurban land use level of on-farm investments, availability of state or local programs to protect farmland, impacted farm size compared to the average, and amount of nonfarmable land that is created.

4300 West Alternative

There would be no direct impacts to prime farmlands under the 4300 West Alternative. Indirect impacts from growth and the local road network would be the same as those for the No-Build Alternative.

3400 West Alternative

The 3400 West Alternative would affect 50 acres of prime farmland. This acreage is under irrigation and might be farmed sporadically; however, these acres are not registered with USDA and are not receiving government assistance. Using the AD 1006 rating form, the 3400 West Alternative is rated 46 (see Appendix D, Farmland Conversion Impact Rating), which is under the 160-point threshold where special mitigation measures and alternatives must be considered and pursued.

Indirect impacts from growth and the local road network would be the same as those for the No-Build Alternative.

2800 West Alternative

There would be no direct impacts to prime farmlands under the 2800 West Alternative. Indirect impacts from growth and the local road network would be the same as those for the No-Build Alternative.

4.2.1.3 Mitigation Measures

Owners of farmland within the Southern Corridor ROW would be compensated according to the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (URAA), as amended, and other state and federal guidelines.

4.2.2 Unique Farmlands

4.2.2.1 No-Build Alternative

There are several established unique farmlands in Washington County; most are producing pecans. It is expected that none of these farms would be affected by the construction of a local road network.

It is not likely that small, profitable farms would experience indirect impacts. However, any unique farmlands that are not currently under cultivation in the urbanized areas of St. George, Washington City, and Hurricane would likely be converted to residential and/or commercial use as shown in the cities' future land use plans (see Section 3.1, Land Use).

4.2.2.2 4300 West Alternative

Review of aerial photography and an initial project field overview showed no affected unique farmlands along the 4300 West Alternative. During a subsequent field visit conducted in March 2002, it was noted that an irrigation system was being installed on an acre parcel, though no crops had been planted. This acre parcel would be affected by this alternative.

Indirect impacts under this alternative would be similar to those for the No-Build Alternative.

4.2.2.3 3400 West Alternative

There would be no direct impacts to unique farmlands for the 3400 West Alternative. Indirect impacts under this alternative would be the same as those for the No-Build Alternative.

4.2.2.4 2800 West Alternative

There would be no direct impacts to unique farmlands for the 2800 West Alternative. Indirect impacts under this alternative would be the same as those for the No-Build Alternative.

4.2.2.5 Mitigation Measures

Owners of farmland within the Southern Corridor ROW would be compensated according to the requirements of the URAA, as amended, and other state and federal guidelines.

4.2.3 Farmlands of State Importance

State-important farmlands are lands actively managed for farming whose specific physical and chemical characteristics are of lower quality than prime farmlands. There are no state-important farmlands in the study area.

4.2.4 Grazing Allotments

The proposed Southern Corridor would cause direct and indirect impacts to five grazing allotments administered by BLM; see Figure 4-4, Potential Impacts to Grazing Allotments.

4.2.4.1 No-Build Alternative

BLM grazing allotments are linked to private land owners adjacent to the allotment. Under the No-Build Alternative, there would be no direct impacts from local transportation projects to grazing allotments actively being used, and the land would continued to be grazed.

Overall livestock operations in the county have, and would continue to be, heavily affected by indirect impacts associated with urban growth, increased outdoor recreation and OHV use, periodic drought, increased vandalism, market fluctuations, low beef prices, and management constraints for protection of threatened and endangered species and other sensitive resources (BLM 1998). Under the No-Build Alternative, these development pressures would reduce grazing allotments in the county.

4.2.4.2 Build Alternatives

Table 4.2-2 provides an overview of the direct impacts to grazing allotments by alternative. Each alternative is summarized by grazing allotment, acres impacted, and animal unit months (AUMs) affected. An AUM is the amount of food required to feed a cow for a month. Loss of each AUM would reduce the amount

of area available to graze cattle, resulting in an economic impact. UDOT would be required to compensate the land owner for the loss of each AUM. Indirect impacts would result from future development planned in the Southern Corridor study area; these impacts would be similar to the No-Build Alternative, although the timing and location of development might be different.

Table 4.2-2. Grazing Allotments Impacted by the Southern Corridor

Grazing Allotment	Total Acreage	Acres Impacted			Total AUMs	AUMs Impacted		
		4300 W	3400 W	2800 W		4300 W	3400 W	2800 W
Warner Ridge	2,535	127	127	127	100	2	2	2
Dome	2,830	105	105	105	237	10	10	10
Warner Valley	1,255	25	25	37	124	2	2	2
Sand Mountain	15,560	0	0	100	1,547	0	0	9
Sand ^a	2,270	0	0	16	276	0	0	2
Total	24,450	257	257	385	2,284	14	14	25

AUM = Animal unit month, the amount of forage required to sustain one cow for one month.

^a Currently the sand allotment AUMs have been purchased by WCWCD for the Sand Hollow Reservoir and recreation area and are not used for cattle grazing.

Source: Leany 2002

4300 West Alternative

Under the 4300 West Alternative, both the Warner Ridge and Dome grazing allotments would be directly affected by the Southern Corridor for a total reduction of 257 acres and 14 AUMs. The portion of land affected by the Southern Corridor would be removed from the permit holders' grazing permits.

Indirect impacts from this alternative could include the bisecting of property making grazing impractical on the remaining properties, direct impacts to range improvements, and restricting access to water sources and grazing areas. Table 4.2-3 provides an overview of these impacts to each grazing allotment. The loss of range land, improvements, and restricted access would have an economic impact on the permit holder by reducing the viability of the land for grazing. The 4300 West Alternative would affect the Warner Ridge, Dome, and Warner Valley allotments.

Table 4.2-3. Direct and Indirect Impacts to Grazing Allotments

Grazing Allotment	4300 West Alternative	3400 West Alternative	2800 West Alternative
Warner Ridge	Currently 20 cattle grazing on 2,535 acres. Southern Corridor would split the property into three sections. About 676 acres would no longer be viable unless a water source is developed at expense of owner. Only water source is a pond on the south-west end that makes access difficult from the west parcels bisected by the highway. The allotment would be severely bisected making most of it nonviable. No existing range improvements impacted.	Same as 4300 W	Same as 4300 W
Dome	Currently 43 cattle grazing on 2,830 acres. Southern Corridor would bisect property and cut access to canal water source. About 584 acres could no longer be viable unless a water source is developed at expense of owner. Restricting access would make moving cattle to different areas difficult and increase expense. Majority of vegetation is in valley where highway will be constructed making most of allotment nonviable. No existing range improvements affected.	Same as 4300 W	Same as 4300 W
Warner Valley	Currently 22 cattle grazing on 1,255 acres. Southern Corridor would split property in two sections, make access between sections difficult, and increase expense. 1,008 acres would have access cut from Virgin River water source and would no longer be viable, which would require developing Warner Valley Spring for a water source at expense of owner. No existing range improvements affected. Entire allotment could become economically nonviable unless Warner Valley Spring is developed.	Same as 4300 W	907 acres would have access cut from Virgin River water source, which would require developing Warner Valley Spring for a water source. This alternative would split property in two sections, making access between sections difficult. No pasture fences affected. Entire allotment could become economically nonviable unless Warner Valley Spring is developed.
Sand Mountain	None	None	Currently grazing 222 cattle. About 46 acres would no longer be viable because of loss of access. Range fences would need to tie into ROW fence. No other impacts.
Sand	None	None	No impact. AUMs purchased by WCWCD for development of Sand Hollow Reservoir and recreation area. No grazing occurs on allotment.

3400 West Alternative

The potential direct and indirect impacts to the 3400 West Alternative would be the same as those for the 4300 West Alternative.

2800 West Alternative

Under the 2800 West Alternative, five grazing allotments would be directly affected by the Southern Corridor (see Table 4.2-2 above). A total reduction of 385 acres and 25 AUMs would occur. In addition, if the Southern Corridor bisected some grazing allotments, this could cause indirect impacts because grazing the remaining smaller parcel would not be practical. The potential indirect impacts are described in Table 4.2-3 above.

4.2.4.3 Mitigation Measures

All five grazing allotments lie within the Southern Corridor footprint, and existing range resources within the ROW would be eliminated. When construction begins, the parts of the grazing permits directly affected by the Southern Corridor would be terminated, and the State would be required to compensate the permit holder(s) for lost AUMs and land improvements affected, such as fences or water structures.

4.3 Social Impacts

4.3.1 Socially Disadvantaged Groups (Environmental Justice)

This analysis considers minority and low-income persons and senior citizens in the proposed Southern Corridor study area. Though senior citizens are not defined as an environmental justice population according to Title VI of the 1964 Civil Rights Act and Executive Order 12898, they are considered to be a vulnerable population (Evans 2001). Due to the large numbers of senior citizens in both the general study area, which contains the cities of St. George, Washington, and Hurricane, and the specific Southern Corridor alignments, potential impacts to this population were examined. Data used to complete this study included the 1990 U.S. census, U.S. Census Bureau Articles, U.S. Department of Health and Human Services statistics, and personal communications.

4.3.1.1 No-Build Alternative

Under the No-Build Alternative, future impacts to minorities, low-income persons, and senior citizens resulting from local transportation projects would be

minor. Most of the area where future roads would be located or existing roads widened is not currently developed or is low density. In addition, the area has a low percentage of minorities (5.1%) and most of the census block groups were at or above the median income for their respective cities.

Indirect impacts from continued growth in the area under the No-Build Alternative could provide economic opportunities for low-income populations. However, if the residential development does not account for low-income residents, their opportunity for home ownership might be reduced. If a regional highway is not provided according to local plans that would link the communities to new facilities such as the St. George replacement airport and proposed industrial and commercial areas, these populations could be under-served and could experience longer travel times.

4.3.1.2 4300 West Alternative

The 4300 West Alternative would not result in disproportionately high or adverse effects on minority or low-income populations in the study area. The percentage of minorities in the general study area is 5.1%, while the percentage of minorities in the specific Southern Corridor alignment is smaller (3.9%). The median household income for the cities in the general study area is comparable to that of each of the block groups within the 4300 West Alternative.

The populations of senior citizens in both the general study area and this alternative were studied in terms of demographics, income, and vulnerability. The demographics of senior citizen populations in both areas indicate that neither area contains a large percentage of minorities (U.S. Census Bureau 2001).

The percentage of the senior citizens below poverty level in 1989 in both the general study area and this alternative accounted for about 6% to 8% of the total population. This was less than the national average of senior citizens below poverty level in 1989, which was 11.4% (U.S. Census Bureau 2001). One specific census tract/block group in Washington City did contain a population of senior citizens below poverty level in 1989 that was higher than the national level. About 22% of the senior citizens were impoverished in census tract/block group 9856-3 (see Figure 3-8, Study Area Census Tracts/Block Groups). However, because this block group is located about 3 miles from the Southern Corridor, there should be no disproportionately high or adverse effects on the impoverished senior citizen population.

The vulnerability of senior citizens is studied because they can be adversely affected by seemingly minor environmental changes. The elderly population in both the general study area and this alternative could experience any of the

following conditions: sensory deprivation, delayed response, chronic illness, and memory disorders (U.S. Department of Health and Human Services 1998).

Examination of minorities, low-income populations, and senior citizens indicates that none of these groups would experience disproportionately high or direct or indirect adverse effects. However, potential effects to these groups and to others near the general study area could include increased noise levels and visual impacts from the Southern Corridor.

4.3.1.3 3400 West Alternative

Direct and indirect impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.1.4 2800 West Alternative

Direct and indirect impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.1.5 Mitigation Measures

UDOT would ensure the use of best management practices (BMPs) to minimize and control substances that could cause adverse human health effects during construction. A detailed discussion of these potential construction-related impacts and mitigation measures is in Section 4.19, Construction Impacts.

4.3.2 Impacts on Neighborhood and Community Cohesion

As described in Section 3.3, Social Environment, both larger and smaller communities are found in the general study area. The larger communities include the cities of St. George, Washington City, and Hurricane. The smaller communities are neighborhoods in these cities such as Bloomington Hills, Bloomington Ranches, Sun River, Middleton, Winding River, Sky Ranch, and Cliff Dweller (Hunter 2001). The cities of St. George, Washington City, and Hurricane, as well as the smaller neighborhoods, are considered to be cohesive (Hirschi 2001).

4.3.2.1 No-Build Alternative

Under the No-Build Alternative, it is anticipated that the communities of St. George, Washington City, and Hurricane, as well as the smaller neighborhood communities, would remain strongly cohesive. However, without a regional roadway like the Southern Corridor to provide access to the airport and other facilities, the cohesive nature of the area could be weakened.

4.3.2.2 4300 West Alternative

The general feeling of the cities in the study area is that the proposed Southern Corridor would promote, not hinder, the cohesion felt by residents in St. George, Washington City, and Hurricane (Hirschi 2001). At the time this document was published, no public comments were received to indicate concerns that community or neighborhood cohesion would be affected by this project. Therefore, it is likely that there would be minimal impacts to community and neighborhood cohesion from the Southern Corridor.

4.3.2.3 3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.2.4 2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.3 Impacts on Travel Patterns and Accessibility

4.3.3.1 No-Build Alternative

Implementation of the No-Build Alternative could cause future impacts to travel patterns in the study area. The impacts include not resolving congested arterials in the study area. City officials and residents have said that in certain areas, particularly in and near St. George, traffic is now at an unacceptable level (HDR Engineering, Inc. 2001a). For example, both St. George Boulevard and Bluff Street in St. George are congested and approaching overcapacity (Nicholson 2001). Also, the entrance and exit ramps to I-15 at the Bloomington exit currently experience congestion. It is likely that expanding the arterial system would further increase congestion.

The No-Build Alternative would also affect future travel patterns in the general study area by not providing a regional roadway to connect the cities to the replacement airport. Without such a facility, travel to the airport would be on local streets, many of which would be congested. In addition, access to many of the planned industrial, commercial, and residential developments would be limited and would not be connected by a regional facility like the Southern Corridor. For example, if resident in Hurricane wanted to access the planned industrial area in southern St. George, no direct access would be provided and local streets would have to be used.

4.3.3.2 4300 West Alternative

Traffic Flow During Construction. During construction, traffic would be affected primarily at the interchange ramps crossing existing surface streets at I-15 and SR 9.

- At the western project terminus, construction of the Southern Corridor/I-15 interchange ramps would affect traffic movement through the I-15/Bloomington interchange.
- At the eastern project terminus, construction of the Southern Corridor/SR 9 interchange ramps would affect traffic movement.
- A few minor roadways between the project termini would also be affected. However, this would not be an impact, since these roadways are not primary arterials to areas of development.

Post-Construction Access. The completed Southern Corridor project would not sever major existing points of accessibility in St. George, Washington, and Hurricane. The facility would provide regional access to the St. George replacement airport and residential, commercial, and industrial developments planned for the southern parts of Hurricane, Washington City, and St. George.

4.3.3.3 3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.3.4 2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.4 Public Facilities

4.3.4.1 No-Build Alternative

There would be no direct impacts to public facilities under the No-Build Alternative. Indirect impacts could occur as a result of the expected growth and development in the study area, which would increase use of public facilities such as schools, churches, and medical facilities. The local city governments would need to plan for and provide additional services to meet the demand. These services would need to be located near areas of new development.

4.3.4.2 4300 West Alternative

As described in Section 3.3, Social Environment, the proximity of schools, churches, and medical facilities to the study area was examined. No public facilities are located in the 4300 West Alternative. Therefore, no impacts to public facilities would occur. Potential indirect growth impacts in the study area would be similar to those for the No-Build Alternative.

4.3.4.3 3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.4.4 2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.5 Public Services and Utilities

4.3.5.1 Public Services

Emergency services were the focus of the evaluation in Section 3.3.6, including fire protection, ambulance service, police protection, and highway patrol. Within the study area, St. George and Hurricane provide their own fire protection, ambulance service, and police protection with additional assistance from the Washington County Sheriff. Washington City operates its own fire station, but the City contracts with the Washington County Sheriff for police protection.

No-Build Alternative

With the increasing population in the study area, implementation of the No-Build Alternative would result in increased traffic congestion along arterial streets serving the study area. This congestion would burden local emergency providers by increasing the risk of accidents and lengthening emergency response times.

4300 West Alternative

The Southern Corridor would reduce traffic congestion, which would improve safety on arterial streets, reduce the risk of accidents, and maintain or improve current emergency response times in the general study area.

Emergency services for the Southern Corridor would be provided by the respective local emergency providers with assistance from the Washington County Sheriff and Utah Highway Patrol as needed. Emergency providers from

St. George feel that the number of emergency calls to the local departments would increase due to the calls from the Southern Corridor, but the increase would not be adverse (Harding 2001).

Emergency providers from Hurricane also feel that emergency calls would increase due to the calls from the Southern Corridor, especially regarding the intersection with SR 9. However, they do not feel this would lengthen the emergency response times because the Southern Corridor is relatively close to Hurricane's city limits (Excell 2001).

3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.5.2 Utilities

No-Build Alternative

Under the No-Build Alternative, most of the new roads required would be in undeveloped areas; therefore, there would be few impacts to utilities. However, as population and development increase, additional services would be required to meet the demand.

4300 West Alternative

This alternative would not require relocating any major power lines, water transmission lines, or wastewater collection lines. However, a few utility poles connecting small-diameter overhead power utility lines would need to be relocated. Temporary, negligible loss of local utility service could occur during the relocation. Such disruptions should be comparable to interruptions for maintenance during normal operations. As with the No-Build Alternative, as population and development increase, additional services would be required to meet the demand.

3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.6 Quality of Life

As discussed in Section 3.3, Social Environment, Washington County has been rapidly growing since 1980 and is projected to continue to grow beyond the year 2030. The movement of new residents to the general study area has been shifting the character of the region from a rural to more urbanized setting. Some residents feel that development would enhance their quality of life. Other residents are concerned that there has already been too much development in St. George and the surrounding areas and the rate of development should decrease (Hunter 2001). The following analysis was conducted to determine how the quality of life in Washington County would be affected by the No-Build and build alternatives.

4.3.6.1 No-Build Alternative

Factors that could affect the quality of life under the No-Build Alternative include natural features, recreation opportunities, agricultural lands, noise, air quality, traffic patterns, safety, emergency services, and the economy. As described in Section 3.1, Land Use, considerable development is planned for the general study area, regardless of whether the Southern Corridor is constructed. With development, natural features of the area that contribute to the quality of life could be affected. This degradation of desert habitat could decrease the biological diversity in the general study area.

In addition, agricultural lands would be lost by such development, which would reduce the amount of open space in the general study area. With the loss of open space, recreation opportunities would be diminished. The loss of open space in the study area can be viewed as an enhancement to the quality of life in that it would allow large residential lots and more room for constructing businesses. However, the loss of open space can also be viewed as diminishing the quality of life because it would reduce natural habitat and recreation activities.

Noise levels are expected to increase and air quality to decrease in the study area due to development and the associated increase in traffic under the No-Build Alternative. Because noise levels and air quality will probably remain within target levels, residents might view these impacts as a necessary side effect of growth in the area. However, other residents might view these impacts as a reduction in their quality of life.

High traffic volumes might be considered by some residents as diminishing the current quality of life because the high traffic volumes that currently exist (and are projected to reach capacity in the study area) decrease the safety of these roadways and increase the burden on local emergency services. However, other residents might consider the high traffic volumes, safety concerns, and burden on emergency services to be acceptable side effects of growth in the study area.

The economy of the study area would become stronger with the planned development. This can be viewed as a decrease in the quality of life because the size of natural areas will decrease and the local tax base would increase. However, other residents might view this as an increase in the quality of life because the economy would offer more job opportunities and increase overall financial stability in the study area.

4.3.6.2 4300 West Alternative

With implementation of the Southern Corridor, growth and development in the region would be similar to that under the No-Build Alternative. Many factors affecting the quality of life in the study area would be the same. The Southern Corridor would also result in degradation of desert habitat, a decrease in biological diversity in the study area, and a loss of agricultural lands, open space, and recreation opportunities. The loss of such resources could be viewed as lowering the quality of life or as acceptable side effects of growth in the study area.

The Southern Corridor would improve public safety and air quality in the region by reducing travel time. Reduced congestion would enhance the quality of life because it would reduce accidents and incidents of aggressive driving.

Noise levels would increase throughout the study area because of the Southern Corridor. Some residents consider an increase in noise levels to be a reduction in their quality of life, while others view it as an acceptable side effect of growth in the study area.

The economy of the study area under this alternative would be essentially the same as under the No-Build Alternative, except that it would become stronger with planned development. Again, this can be viewed as a decrease in the quality of life because it would result in a decrease of natural areas and an increase in the local tax base, or an enhancement to the quality of life because the economy would offer more opportunities and increase financial stability in the study area.

4.3.6.3 3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.6.4 2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.7 Public Health and Safety

4.3.7.1 No-Build Alternative

Recent population trends have consisted of high annual growth rates. These trends are projected to continue through 2030. With implementation of the No-Build Alternative, areas with high traffic volumes currently approaching capacity as identified in Section 1.3, Corridor Capacity and Level of Service, would soon reach capacity. The increased traffic volumes would correspond with an increase in incidents of aggressive driving and traffic accidents. Under the No-Build Alternative, there would be no alternate route to I-15 if it were closed because of a traffic accident.

4.3.7.2 4300 West Alternative

At this time, there are no alternate routes for I-15 on main arterials providing service to the southern part of Washington County and to Zion National Park from the south. The Southern Corridor would provide an alternate route to these areas if I-15 were closed because of a traffic accident. Because the level of congestion on local roads near the cities would not change considerably compared to the No-Build Alternative, the potential for aggressive driving and traffic accidents on local roads would be similar. However, because the Southern Corridor would provide a less-congested route to the replacement airport and planned development in the south part of St. George, travel to this area would have less congestion.

4.3.7.3 3400 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.7.4 2800 West Alternative

Impacts from this alternative would be the same as those for the 4300 West Alternative.

4.3.8 Recreation Resources

This section discusses impacts of the proposed Southern Corridor on recreation resources. The alternatives and recreation resources are shown in Figure 4-5, Recreation Resource Impacts.

4.3.8.1 No-Build Alternative

The recreation resources in the study area are expected to experience increased use as the population and recreation demands in the study area grow. No direct impacts to recreation areas are anticipated from the local roadway projects planned under the No-Build Alternative.

Indirect impacts to recreational resources could occur as the area develops. It is expected that recreation opportunities would initially expand with the development of Sand Hollow Reservoir. However, as development increases south and east of I-15, recreation opportunities would diminish with the change in land use from open to residential/commercial and the increased pressure on developed recreation areas. These diminished recreation opportunities, in addition to increased development and population, could result in more recreation involving the undeveloped desert in the limited remaining areas on BLM land, such as Warner Ridge (which has been designated an ACEC, or area of critical environmental concern). The ACECs were designated to provide additional protection for sensitive resources, including federally listed plants and habitat under the Endangered Species Act.

4.3.8.2 Build Alternatives

With the increase in population and subsequent development, there will be increased pressure on recreation resources and areas designated for environmental protection. One area of critical concern is the Warner Ridge ACEC, which provides habitat for the endangered bearclaw poppy. All Southern Corridor build alternatives would beneficially affect the bearclaw poppy by providing a barrier to this area. Limiting unauthorized recreation access in this ACEC would allow BLM to better manage ATV/OHV use.

In addition, the Southern Corridor (except for interchange locations) would provide a barrier to much of the undeveloped desert south and east of the highway, which could allow better management. Provided below is an analysis of direct and indirect impacts to specific recreation areas.

4300 West Alternative

White Dome. The proposed Southern Corridor bends southeast just below White Dome. There would be no adverse impacts or access issues concerning this area.

Warner Ridge/Fort Pearce ACEC. The proposed Southern Corridor would potentially limit access to this area. Although this area is clearly posted as restricted access to preserve bearclaw poppy habitat, some ATV/OHV use still occurs. The proposed Southern Corridor's potential to limit access to this area could help BLM better manage ATV/OHV use by providing fewer access points to the Warner Ridge ACEC. Fewer access points would also allow BLM to better manage other recreation activities at this location.

Dinosaur Track/Fort Pearce Historic Site. An interchange on the Southern Corridor would provide access to these recreation areas from St. George. The Southern Corridor would not affect access to these sites from Hurricane.

Dutchman/Sunshine Loop Trails. The proposed Southern Corridor would not affect access to these designated mountain bike areas.

Anasazi Mountain Men. This area serves as a winter rendezvous site. The proposed Southern Corridor would prohibit use of this area. Use of this site is authorized by a permit from the St. George/Washington Canal Company. If the Southern Corridor is built, the permit would not be renewed.

Temple Trail. The proposed Southern Corridor would intersect the Temple Trail near Warner Ridge. This trail is used by a limited number of equestrians, hikers, and OHV/ATV users. The trail is not marked or defined in the project area. Although direct use of the trail might be blocked, an overpass near the trail would provide continued access.

Honeymoon Trail. The proposed Southern Corridor would cross the Honeymoon Trail just southeast of the divergence of the Honeymoon and Temple Trails west of Warner Ridge. This trail is used by a limited number of equestrians, hikers, and OHV/ATV users. The trail is not marked or defined in the project area. Although this perpendicular crossing might block direct use of the trail, an overpass near the trail would provide continued access.

The indirect impacts of the build alternatives would be similar to those described for the No-Build Alternative. Under the No-Build and build alternatives, the area south and east of I-15 would be developed, which would increase the use of recreational resources. The greatest impact would be use of the undeveloped desert and sensitive environmental areas as the population increases. It is anticipated that the Southern Corridor could reduce the unauthorized recreational use in some sensitive environmental areas by limiting some access.

3400 West Alternative

Potential direct and indirect recreation impacts from the 3400 West Alternative would be the same as those for the 4300 West Alternative.

2800 West Alternative

Potential direct and indirect recreation impacts from the 2800 West Alternative would be similar to those for the 4300 West Alternative, except as noted below.

Sand Hollow Reservoir and Recreation Area. The proposed Southern Corridor would provide access to the new reservoir. It would also enhance access to recreation activities (such as water-based recreation, OHV use, equestrian activities, hiking, biking, and camping) that were proposed with the development of the reservoir.

Sand Mountain. This area is designated an SRMA by BLM. With the development of Sand Hollow Reservoir, this area will offer a variety of recreation opportunities and be part of the Sand Hollow Recreation Area. BLM has concerns that Southern Corridor could limit access from the Sand Hollow Reservoir into the Sand Hollow Recreation Area on BLM lands. To minimize impacts, the highway design would include underpasses at key locations to allow recreational access.

Dominguez-Escalante Trail. The proposed Southern Corridor would intersect this trail just south of Sand Hollow Reservoir. The trail in this area is not easily identifiable, which would limit its use. Additionally, the Sand Hollow Reservoir has been built across the trail, cutting off access from the north. The proposed Southern Corridor project would not further restrict access to the trail.

4.3.8.3 Mitigation Measures

All Southern Corridor build alternatives would intersect the Temple and Honeymoon Trails. Although these trails are not marked in the project area, trail markers directing trail users along overpasses or underpasses, using the Southern Corridor proposed trail, would be provided to allow continued use.

If the 2800 West Alternative is selected, UDOT would work with BLM and the Utah Division of Parks and Recreation to provide access between the Sand Hollow Reservoir and the Sand Hollow Recreation Area to the south.

4.4 Relocation Impacts

The terms *relocation* and *displacement* are used interchangeably in this EIS and refer to residences and farms that would be directly affected by the Southern Corridor.

Most of the proposed ROW for the build alternatives is largely undeveloped. While it is desirable to minimize residential and farm impacts, the proposed Southern Corridor would require acquiring property and displacing some residential property and farms.

As discussed in Chapter 1, Purpose of and Need for Action, and Chapter 2, Alternatives, the region's projected growth would require substantial transportation improvements even with the No-Build Alternative. These improvements could expand existing arterial streets and collector roads and would displace some local residences and farms. However, these property impacts under the No-Build Alternative cannot be quantified in this EIS because the specific roadway designs have not been developed.

As stated in Section 3.4, Relocation, the acquisition and relocation program would be conducted according to the URAA. Relocation resources are available to all residents and businesses that are relocated, and the process for acquiring replacement housing and other sites would be fair and open.

Figure 4-6, Potential Displacements, shows the locations of residences and farms that would be displaced under each of the build alternatives.

4.4.1 Residences

Single-family housing is the predominant type of residence in the Southern Corridor study area. Unless otherwise noted, the identified structures in the area that would be impacted are occupied.

The URAA requires UDOT to provide financial and technical relocation assistance for displaced residents. In addition, if housing of comparable size and value to that being displaced is not available, or is not available within UDOT's payment limits, then UDOT would invoke a process called "housing of last resort." This process allows UDOT to provide necessary housing through any of several methods, including:

- Purchasing a comparable residential property and making it available to the displaced person in exchange for the displaced property
- Relocating and rehabilitating (if necessary) a dwelling purchased by UDOT and making it available to the displaced person in exchange for the displaced property
- Purchasing, rehabilitating, and/or constructing additions to an existing dwelling to make it comparable to a particular displaced property
- Other measures that fairly compensate for the displaced residence

4.4.1.1 No-Build Alternative

Under the No-Build Alternative, residential displacements could occur as the cities make transportation improvements to reduce traffic congestion. However, because detailed roadway plans have not been developed, it is not possible to accurately estimate the number and nature of these impacts. Most of the new roads required for the No-Build Alternative would be in undeveloped areas and would not require relocations.

4.4.1.2 Build Alternatives

Figure 4-6, Potential Displacements, shows the residential displacements for each of the build alternatives. Locations of displacements are listed in Table 4.4-1. The 3400 West Alternative would result in more relocations than the 4300 West and 2800 West Alternatives.

Table 4.4-1. Residential Displacements by Alternative

Alternative	Displacements	Address
4300 West	1	West end of Warner Valley Road
3400 West	4	172 West 1720 North; 2383 East Lenox Court; 1275 Highland Drive; west end of Warner Valley Road
2800 West	1	West end of Warner Valley Road

4.4.1.3 Mitigation Measures

Assistance and reestablishment expenses would be provided to the displaced property owners and lease holders according to eligibility requirements and other requirements of the URAA.

4.4.2 Farmsteads

Even though the study area has a rural character, only one farm would be affected by the build alternatives. Acquisition of farmland for highway construction is not considered a farm displacement unless the amount of farmland acquired is enough to make the remainder of the farm nonviable.

Although no farm displacements are anticipated under any of the build alternatives, if any farms are developed before construction of the Southern Corridor, UDOT would work with the farm owner to determine the eligibility of benefits under the URAA. Generally, UDOT would provide compensation for the expense of reestablishing farm enterprises and for fair market value of the buildings and land.

4.4.2.1 No-Build Alternative

No farm displacements are expected under the No-Build Alternative.

4.4.2.2 Build Alternatives

No farm displacements would be caused by any of the build alternatives.

4.4.3 Summary of Displacements

Table 4.4-2 summarizes the potential of residential and farmstead displacements for each of the build alternatives. These are also shown in Figure 4-6, Potential Displacements.

Table 4.4-2. Summary of Displacements

Type of Displacement	4300 West Alternative	3400 West Alternative	2800 West Alternative
Residential	1	4	1
Farmstead	0	0	0
Total	1	4	1

4.5 Economic Impacts

Economic impacts in this analysis were examined on both the regional and local levels. Within each of these levels, two types of impacts were considered.

- Temporary (short-term) impacts are associated with construction expenditures and the indirect economic impacts generated by them.
- Permanent (long-term) impacts consist of continuing operation and maintenance activities, the addition of commercial and residential development that would occur as a result of the project, and the benefits to road users who experience shortened travel times.

This analysis was based on data from State statistics on business and unemployment from the Web site of the Governor's Office of Planning and Budget, the Washington County assessors' offices, and personal communications with local planning and city management officials.

4.5.1 Regional Economic Impacts

The region considered in this analysis is Washington County with primary focus on the southern and eastern parts of the county. This region is second to the Wasatch Front in percentage of Utah's commerce (Utah State Tax Commission 2001).

4.5.1.1 No-Build Alternative

In the absence of functionally equivalent local projects, implementation of the No-Build Alternative could permanently adversely affect the regional economy by not providing a regional transportation facility between St. George and Hurricane, alleviating traffic congestion on arterial streets and intersections, or serving planned development in the study area. Congestion translates into higher opportunity cost (lower productivity because of lost time) in the movement of goods, services, and workers. Increasing levels of congestion could, over time, affect the ability of the communities in the study area to attract new business, but overall growth in the region would not be affected.

Without a regional facility, travel from Washington City and Hurricane to the proposed St. George replacement airport and industrial/commercial areas in the southern parts of St. George would be made on congested arterials instead of a high-speed roadway, further increasing lost time and economic impacts. As shown in Table 2.1-3, Build versus No-Build VMT, VHT, and Average Speed (Capacity Constrained), the No-Build Alternative would result in a 7.7% increase in travel time compared to the build alternatives.

4.5.1.2 4300 West Alternative

Construction of any Southern Corridor alternative could result in temporary and permanent impacts on the employment and recreation sectors of the regional economy.

The Southern Corridor alternatives would add jobs in the region. According to Utah's state economic model, each \$1 million in project construction expenditures translates to over six construction jobs and many more jobs in related industries (GOPB 1994). However, these construction jobs are temporary in nature, lasting only for the duration of the project.

Since the Southern Corridor would tend to redistribute growth in the region rather than induce growth, a net increase in the number of permanent jobs in the region specifically attributable to the project is not anticipated. For example, new jobs that would result from new businesses locating along the Southern Corridor would likely come at the expense of new jobs in other project area cities, primarily St. George. This does not imply that St. George would lose jobs, but indicates that the next new hotel, convenience store, or other service-based business might be located along the new corridor rather than in St. George.

No federal mineral reservation royalties would be affected because there currently is no mining along the Southern Corridor.

All build alternatives would have a permanent beneficial impact on recreation by providing more direct access to Zion National Park. Also, the Southern Corridor would have a pedestrian, bicycle, and equestrian trail paralleling it.

4.5.1.3 3400 West Alternative

Impacts from this alternative to the regional economy would be the same as those for the 4300 West Alternative.

4.5.1.4 2800 West Alternative

Impacts from this alternative to the regional economy would be the same as those for the 4300 West Alternative.

4.5.2 Local Economic Impacts

This discussion of local economic impacts of the project alternatives focuses on those impacts that are traditionally examined in a NEPA document, including temporary and permanent effects on the communities' economic base resulting from highway construction. Typically, these direct economic impacts from a project are the displacement of homes, farms, and businesses; changes in vehicle access; severance of land parcels; and division of communities, which is viewed by the community as a permanent impact. Additional indirect impacts that are studied include a change of local tax base and property values. These are considered secondary impacts because they occur as a result from a change in the quality of life of an area due to visual, air quality, and noise impacts from a transportation project.

This economic impact analysis was conducted by interviewing local community officials, local emergency providers, and other members of the community, and by studying public comments received during the public scoping period from February to May 1999 and the public scoping period from September to October 2001.

4.5.2.1 No-Build Alternative

Implementation of the No-Build Alternative would not provide a regional transportation facility, which could worsen existing conditions and create additional safety concerns. For example, both St. George Boulevard and Bluff Street in St. George are congested and approaching overcapacity (Nicholson 2001). Also, the entrance and exit ramps to I-15 at the Bloomington exit currently experience congestion (HDR Engineering, Inc. 2001a). As noted in Section 4.5.1.1, congestion could translate into a higher opportunity cost (lower productivity because of lost time) for local businesses.

4.5.2.2 4300 West Alternative

Bypass Impacts. Many local business owners feel that the Southern Corridor would have a negative impact on the local economy because it would divert northbound traffic headed to Zion National Park and other recreation areas away from the cities in the study area, primarily St. George. Consequently, the Southern Corridor would hurt existing local businesses such as hotels, restaurants, and shops (HDR Engineering, Inc. 2001a).

Conversely, other business owners and residents feel that the Southern Corridor would have a positive impact on the local economy by bringing commercial and residential development to Hurricane and the area south of St. George (HDR Engineering, Inc. 2001a). The planned development for the area, such as the new airport, industrial park, and residential areas, would add to rather than detract from the local economy.

Studies conducted regarding the economic impacts of bypass routes on cities conclude that such roadways produce both positive and negative impacts on the bypassed cities. However, the highways bypassing the cities are “seldom either devastating or the savior of the area” (Collins and Weisbrod 2000). The modification of traffic patterns can cause some businesses to close or relocate, but can also establish areas of new business opportunity. Researchers have concluded that the net positive or negative economic impacts to the broader community, which in this case consists of St. George, Washington, and Hurricane, are comparatively small (Collins and Weisbrod 2000).

Fiscal Impacts. Section 4.4, Relocation Impacts, provides details on the number and location of potential residential and farm displacements. The identified displacements and other property acquisitions could affect the local economy in several ways including removal of land from the tax base, reductions in local employment and earnings, and reduction in local sales tax. These losses to the local tax base could result in a decrease in the general fund of the affected cities. However, about 42% of the land for the Southern Corridor would be from BLM. No taxes are currently collected for this land, and the land for the most part would not be developed in the future.

4.5.2.3 3400 West Alternative

Potential impacts to the local economy under this alternative would be the same as those for the 4300 West Alternative.

4.5.2.4 2800 West Alternative

Potential impacts to the local economy under this alternative would be the same as those for the 4300 West Alternative.

4.6 Joint Development Impacts

Joint development represents opportunities to retain or enhance important values in the communities affected by the proposed project. The Southern Corridor project is part of a joint development effort between BLM, UDOT, and the local communities. The Southern Corridor has been included as part of the BLM St. George Field Office's Resource Management Plan. BLM has been working with UDOT and the local communities to identify a suitable route for the proposed highway (BLM 1998).

4.6.1 Southern Corridor Trail

The Southern Corridor could include a joint development opportunity involving a trail for pedestrians, bicyclists, and equestrians. This trail would extend the length of the proposed project and could connect to other trails in the area such as the Washington County Regional Trail Cooperative Master Plan system. The Southern Corridor trail would connect to the nonmotorized trail system being implemented in the region, further expanding nonmotorized travel.

4.6.1.1 No-Build Alternative

Under the No-Build Alternative, federal and local agencies and cities would continue to jointly develop a regional nonmotorized trail system. However, without the Southern Corridor, there would be no regional trail system in the southern part of the study area.

4.6.1.2 Build Alternatives

A multi-use trail, the Southern Corridor Trail, is proposed in conjunction with all build alternatives. It would be a Class I trail (separated from motorists) that offers recreation opportunities for pedestrians, bicyclists, runners, and equestrians and would run the length of the highway.

The trail would consist of a 10-foot (3-meter) unpaved portion for pedestrians, bicycles, and equestrians. Although there are no current plans for other trails in the area to connect to the Southern Corridor Trail, BLM and city officials see this as an opportunity to provide a regional connection between other trail systems as they develop in the future. The system would benefit the residents of the area as well as tourists who visit the area. The trail would be built on the north and west

side of the corridor to allow for easy connection points. The trail would also allow recreationists to access other recreation areas along the Southern Corridor.

4.6.1.3 Mitigation Measures

The 328-foot (100-meter) highway ROW proposed for this project includes room for the trail. Impacts on threatened and endangered species and wildlife caused by the trail would be included in the mitigation for the overall project.

4.7 Impacts on Consideration Related to Pedestrians and Bicyclists

4.7.1 Current Facilities

4.7.1.1 No-Build Alternative

The No-Build Alternative would not directly affect any existing trail systems since most of the new arterials would be in the southern part of the study area where no current trails exist. The current trails would see increased pedestrian and bicycle use as the area's population continues to grow.

4.7.1.2 Build Alternatives

None of the build alternatives would have direct or indirect impacts on existing pedestrian and bicycle trails (see Figure 3-10, Pedestrian and Bicycle Trails).

4.7.2 Proposed Facilities

4.7.2.1 No-Build Alternative

Under the No-Build Alternative, the federal and local agencies and the cities would continue to develop a regional nonmotorized trail system. However, without the Southern Corridor there would be no regional trail system in the southern part of the study area.

4.7.2.2 Build Alternatives

In coordination with local cities, Washington County, BLM, and SITLA, the Southern Corridor Trail would link other proposed trails in the study area. As shown in Figure 3-10, Pedestrian and Bicycle Trails, the Southern Corridor would cross several locations where trails might be built in the future. These trails would connect to the Southern Corridor Trail, which would provide greater access to other trails in the system.

The Southern Corridor would positively affect proposed facilities for pedestrians and bicyclists. Development of a multi-use trail would greatly enhance pedestrian and bicycling opportunities in the study area and the region.

4.8 Air Quality Impacts

This section identifies potential impacts on air quality associated with the construction and operation of the Southern Corridor. The impacts of construction activity would be temporary and are discussed in Section 4.19, Construction Impacts. The impacts of highway operation would be long-term and directly related to traffic volumes and average speeds. Therefore, this discussion addresses the major pollutants in motor vehicle exhaust emissions: carbon monoxide (CO), particulate matter (PM), ozone (O₃), and precursors to ozone.

4.8.1 Pollutants Evaluated

Carbon Monoxide. CO is a colorless, odorless gas formed by incomplete fuel combustion. As a direct component of vehicle exhaust, CO is considered a primary pollutant. The concentration of CO at any given location is largely determined by the rates of emission from nearby sources (such as vehicle exhaust), meteorological variables (such as wind direction and speed), and topographical features near the point of emission. CO concentrations tend to be high on or next to congested roadways, particularly during cold temperatures and inversions, but decrease rapidly as the distance from the source increases.

Particulate Matter. Particulate matter can come from sources such as windblown dust from agricultural fields and construction sites, vehicle emissions, and dust resuspended by vehicle tires on paved and unpaved roads. PM_{2.5} is finer particles that are 2.5 microns in diameter or smaller; they are generally emitted from residential sources (such as fireplaces and wood stoves), motor vehicle exhaust, and combustion.

Precursors to PM include sulfur oxides (SO_x), nitrogen oxides (NO_x), and volatile organic compounds (VOCs), but most of the secondary PM produced from these precursors happens over relatively large distances, so precursors to PM are currently not an issue for project-level analysis.

Both PM₁₀ and PM_{2.5} are regulated by EPA. PM₁₀ is specifically addressed by federal rules that apply to certain federally funded transportation projects (40 CFR 93, Subpart A) in nonattainment areas. Because the project area is designated as attainment/unclassified for PM₁₀, no quantitative or qualitative analysis for this pollutant is required. Also, any quantitative PM₁₀ analysis called for in these rules does not apply to any projects until EPA develops a

methodology (emission factors, models, and so on) to analyze PM₁₀ impacts from highways. At this time, EPA does not require PM_{2.5} analysis for either stationary or mobile sources, pending collection of background data and modeling methods and revisions of rules to specify such analysis.

Ozone and Ozone Precursors. O₃ is a secondary pollutant formed when precursor emissions, NO_x and VOCs, react in the presence of sunlight. A primary source of O₃ precursor emissions is motor vehicle exhaust. O₃ concentrations are usually lower near emission sources and higher farther away. Additionally, if O₃ concentrations are excessive in one location, it is likely that excessive concentrations occur over a widespread region. Thus, O₃ is considered a regional pollutant and is not addressed at the project level.

4.8.2 Air Emissions Estimates

4.8.2.1 Construction

The Southern Corridor project would be constructed in three phases. The completion dates are estimates.

- The first phase would be a two-lane segment about 10 miles long from I-15 to the proposed St. George replacement airport, to be completed by 2008.
- The second phase would extend the two-lane segment about 10 miles from the airport to SR 9, to be completed by 2010. The distance would vary slightly depending on the alternative selected.
- The third phase would add two lanes to create a four-lane freeway for the entire project length (about 20 to 26 miles), to be completed sometime between 2015 and 2025 depending on traffic demand.

No detailed information is available for the activity levels of construction equipment during each phase of this project. Therefore, construction emissions have been conservatively estimated using those calculated for the Legacy Parkway project in the Salt Lake City area. The Legacy Parkway project construction emissions are provided in the *Emissions Control Plan and Memorandum of Understanding for the Legacy Parkway Project* (Fluor Ames Kraemer 2000).

The Legacy Parkway project is a four-lane freeway of about 14 miles in length, which was projected to be constructed over 4 years starting in 2001. Estimated construction-related emissions over these 4 years are shown in Table 4.8-1.

Table 4.8-1. Legacy Parkway Project Estimated Construction Emissions

Year of Construction Activity	Project-Generated Total Annual Emissions (tons/year)				
	CO	NO _x	SO ₂	PM ₁₀	VOCs
2001	15.6	56.0	7.0	209	3.7
2002	34.6	135.4	17.3	697	8.7
2003	32.8	101.8	17.3	630	8.2
2004	10.7	28.7	3.9	18	1.9
Source: Fluor Ames Kraemer 2000					

It is assumed that the total construction emissions for the Southern Corridor would be proportional to the equivalent number of lanes and length of highway segment for the Legacy project. The third phase of the Southern Corridor project most closely matches the level of construction and expected duration of construction for the Legacy project (4 years). The first two phases of the Southern Corridor project would be somewhat under half the total lane length for the Legacy project. Thus, for the peak construction years on the Southern Corridor, construction-related emissions are expected to be less than the emissions projected for Legacy (possibly up to 30% less).

Based on this comparison, if the Southern Corridor maximum construction emissions were about 500 tons/year for PM₁₀ and 100 tons/year for NO_x, these emissions would represent less than 5% of the existing baseline (1994) emissions inventory for Washington County (see Table 3.8-4, 1994 Project Area Existing Emissions). This change is too small to have a major effect, and there would be no long-term effects because the emissions would be temporary.

4.8.2.2 Operation

Estimated emissions for operation of the No-Build and build alternatives are compared in Table 4.8-2 below. These estimates are based on VMT projections together with emission factors (see Table 3.8-4, 1994 Project Area Existing Emissions) generated by EPA's PART5 and MOBILE5b emission models (EPA 1994, 1995). PART5 was used to estimate SO₂ and PM₁₀ emissions, and MOBILE5b was used to estimate NO_x, CO, and VOC emissions.

Although the estimated emissions shown in Table 4.8-2 result in an increase in emissions compared to existing conditions, the total estimated highway network emissions for each alternative are still relatively small compared to the totals for larger western cities such as Denver and Salt Lake City. These cities have experienced improvements in air quality and have recently been redesignated from nonattainment to attainment zones for ozone. For example, the total

estimated 1994 NO_x emissions in the metropolitan Salt Lake, Utah, and Davis Counties were about 200 tons/day (EPA 2002b) compared to 12 tons/day for the build alternatives in the year 2030.

Each build alternative would increase PM₁₀, NO_x, and SO₂ emissions only very slightly compared to the No-Build Alternative, while CO and VOC emissions for the build alternatives would be slightly less than the No-Build Alternative. Emissions include traffic to the proposed St. George replacement airport.

Table 4.8-2. Estimated Regional Emissions for Highway Vehicles, Highway Network Totals for St. George/Hurricane/Washington County in 2030

Parameter	No-Build Alternative	4300 West Alternative	3400 West Alternative	2800 West Alternative
Daily VMT (miles)	4,675,589	5,195,102	5,221,855	5,168,917
Daily VHT (hours)	214,455	198,810	198,217	196,763
Average speed (mph)	21.8	26.1	26.3	26.3
PM ₁₀ factor (g/VMT)	0.37	0.37	0.37	0.37
PM ₁₀ emissions (tons/day)	1.9	2.1	2.1	2.1
CO factor (g/VMT)	32.62	26.32	26.07	26.07
CO emissions (tons/day)	168.1	150.7	150.1	148.5
NO _x factor (g/VMT)	2.12	2.11	2.11	2.11
NO _x emissions (tons/day)	10.9	12.1	12.1	12.0
SO ₂ factor (g/VMT)	0.115	0.115	0.115	0.115
SO ₂ emissions (tons/day)	0.6	0.7	0.7	0.7
VOC factor (g/VMT)	3.30	2.92	2.91	2.91
VOC emissions (tons/day)	17.0	16.7	16.7	16.6

g/VMT = grams per vehicle-mile traveled

4.8.3 Potential Air Quality Impacts

4.8.3.1 No-Build Alternative

Under the No-Build Alternative, air emissions levels would likely increase in the study area as population increases and new residential, commercial, and industrial developments are built. However, as shown above in Table 4.8-2, the vehicle-related emissions for PM₁₀, NO_x, and SO₂ would be less than those under the build alternatives. VOC and CO emissions under the No-Build Alternative would be slightly greater than those under the build alternatives. Overall vehicle emissions between the No-Build and build alternatives would be similar.

4.8.3.2 Build Alternatives

Potential Mesoscale Air Quality Impacts

Projects that increase regional traffic levels can increase pollutant emissions in the region, which can affect pollutants that are of concern over larger urban scales such as ozone or fine particulate matter. The St. George area is a relatively small urban area at this time and is in attainment for all NAAQS (see Table 3.8-1, National Ambient Air Quality Standards). The proposed Southern Corridor alternatives are expected to enhance the overall effectiveness and efficiency of trips in the region by generally decreasing trip times, so the project should decrease regional vehicle emissions of CO and VOCs.

On a local level, emissions would increase near the new highway corridor. Potential local impacts of vehicle emissions are analyzed as part of the mainline analysis in the following section.

Potential Microscale Air Quality Impacts

The entire project area is currently designated as meeting NAAQS (see Section 3.8, Air Quality); therefore, dispersion modeling analysis is not required by federal rules on Transportation Conformity (40 CFR 93, Subpart A). However, to assure that the project alternatives would not adversely affect air quality, an analysis of localized, microscale impacts was conducted for CO, typically the pollutant of greatest concern for transportation projects.

The CO mainline impact analysis was conducted for the design year 2030 for the build alternative and roadway segment that is projected to have the highest traffic level. The 4300 West Alternative, for the segment from I-15 (Atkinville interchange) to the first intersection, is projected to have the highest traffic level with a two-way ADT of 60,713 vehicles. If the projected impacts for this segment do not violate the NAAQS for CO, then the other alternatives and highway segments for the project would also comply with the NAAQS for CO.

The microscale dispersion modeling analysis must be conducted for the 1-hour period with the highest traffic level during a 24-hour period. The typical conversion factor of 0.1 was used for this analysis, meaning that the peak 1-hour traffic level is assumed to be 10% of the ADT, or 6,071 vehicles per hour.

Table 2.1-1, 2030 LOS, No-Build and Build Alternatives, shows that a few miles of I-15, from the proposed Atkinville interchange to St. George Boulevard and SR 9 at 1760 East, would experience slight increases in traffic levels for the various build alternatives compared to the No-Build Alternative. However, arterial streets in the region would experience reductions in traffic level due to use of the Southern Corridor. Overall, of the 33 segments modeled for the Southern

Corridor project, 26 would experience a decrease in ADT. Therefore, the project is expected to have an overall beneficial effect on air quality emissions.

The mainline CO analysis required two models: an emissions model to obtain fleet-average vehicle emission rates and a dispersion model to predict concentrations downwind of the roadway corridor. This analysis used the current EPA-recommended models for this purpose: the MOBILE5b emissions model and the CAL3QHC (version 2.0) (EPA 1992a) dispersion model. The following sections summarize the inputs to these models and the results that were obtained.

MOBILE5b Emissions Modeling

The MOBILE5b emissions model was used to estimate fleet-average vehicle CO emission rates on the proposed Southern Corridor mainline for the year 2030. While the design speed of the Southern Corridor mainline would be 70 mph, a speed of 65 mph was used for the model run since this is the top speed allowed by MOBILE5b. Other MOBILE5b inputs used the national default vehicle mix, and no inspection/maintenance program or oxygenated fuels program was simulated since these are not required in the local area (Bingham 2001). However, because some traffic using the Southern Corridor would be from other urban areas with these programs, the emissions model results should be somewhat conservative (high).

The fleet-average CO emissions factor from the MOBILE5b emissions model was 22.14 g/VMT. This value was input to the CAL3QHC model for the dispersion analysis.

CAL3QHC Dispersion Modeling

The CAL3QHC model was applied to the first segment planned for the Southern Corridor, which connects to I-15 on the corridor's southern end. This segment runs approximately northwest-southeast and has two 12-foot lanes in each direction. The minimum 60-foot width for the median was assumed for this analysis along with a ROW width of 300 feet. Two at-grade, 4,000-foot-long, free-flow roadway segments were input to CAL3QHC, one for the northwest-bound lanes and one for the southeast-bound lanes. A total of 20 receptors were modeled at the ROW edge with 10 on each side of the freeway. The receptors were modeled near the southeast end of the segments such that a northwest wind would provide the greatest impact. It was found that extending segment length beyond 4,000 feet would not further increase concentrations because the concentration results for the last few receptors on the southeast end of the segment converged to a stable value.

The meteorological and background concentration data input to CAL3QHC analysis are listed in Table 4.8-3. These data were developed based on the EPA document *Guideline for Modeling Carbon Monoxide from Roadway Intersections* (EPA 1992b) and on recommendations from UDEQ.

Table 4.8-3. Meteorological and Background Concentration Input Parameters

Parameter	Value	Basis
Stability category	5 (E)	Rural land use designation
Wind speed	1.0 m/s	EPA recommended
Roughness length	108 cm	Corresponds to single-family residential
Mixing height	1,000 m	EPA recommended
Settling velocity	0	EPA recommended
Deposition velocity	0	EPA recommended
Persistence factor	0.7	EPA recommended default
Background 1-hour CO concentration	5.0 ppm	UDEQ
Background 8-hour CO concentration	3.0 ppm	UDEQ

The atmospheric stability category of 5 (E), or slightly stable, is assigned based on predominant land use type, either rural or urban, within 3 kilometers (1.8 miles) of the anticipated roadway for the design year 2030. While urban might appear to be the appropriate category, the EPA-recommended land use analysis procedure classifies the current suburban-style, single-family developments as rural land use. If the urban classification had been selected, the stability category would be 4 (D) which corresponds to neutral conditions, which would have led to greater dispersion than the selected stability category 5 (E). Thus, an urban classification would have resulted in lower concentration results.

There are no CO monitoring data available that could be used to establish background CO concentrations in the St. George area. The 1-hour and 8-hour average background CO concentrations for this analysis were set to 5.0 and 3.0 ppm, respectively, based on the recommendation from UDEQ, Division of Air Quality (Orth 2001). These values, representative of more highly developed urban areas such as Salt Lake City, should provide conservative (high) estimates of the background concentrations in the project area.

Air Quality Analysis Results

The results of the CAL3QHC dispersion modeling analysis are summarized in Table 4.8-4. The maximum 1-hour and 8-hour impacts for the worst-case 2030 Southern Corridor alternative and freeway segment are below their respective

NAAQS. For the reasons described above, these results are expected to be somewhat conservative (high). Therefore, the Southern Corridor is not expected to exceed the NAAQS regardless of the alternative selected.

Table 4.8-4. Maximum Predicted CO Concentrations Compared to NAAQS

Averaging Period	Background Concentration (ppm)	Modeled Concentration (ppm)	Total Concentration (ppm)	NAAQS (ppm)
1-hour	5	6	11	35
8-hour	3	4.2	7.2	9

Conformity with State Implementation Plan and Maintenance Plan

The Clean Air Act requires that certain federally funded or approved transportation activities that involve a regionally important roadway or will increase traffic at critical intersections must conform to state air quality goals. Transportation activities must not:

- Cause or contribute to new air quality standard violations
- Worsen existing violations
- Delay attainment of air quality standards

Transportation Conformity (40 CFR 93, Subpart A) applies in areas that do not meet the NAAQS (nonattainment areas) and in areas that have a maintenance status because they previously did not meet the NAAQS. Because the project area has always been designated as meeting NAAQS, transportation conformity requirements do not apply to the proposed Southern Corridor project.

4.8.4 Mitigation Measures

Air emission mitigation measures for construction would be developed as part of the Emission Control Plan submitted to the State of Utah. Mitigation measures would include the following:

- ***Fugitive Dust Control.*** The contractor would maintain a fugitive dust control program. This program would include wetting excavation areas, unpaved parking and staging areas, and onsite stockpiles of debris, dirt, or dusty material.
- ***Street Sweeping.*** The contractor would use street-sweeping equipment at paved site access points.
- ***Equipment Emissions.*** The contractor would shut off construction equipment when not in direct use to reduce idling.

4.8.5 Cumulative Impacts

The growth in the project area has had little effect on Washington County and southern Utah's air quality (the geographic boundary of the cumulative impact analysis) as demonstrated by the area's attainment status for all NAAQS pollutants. However, overall air emissions associated with development would increase. The population in the project area is expected to grow from 66,993 persons in 2000 to 208,641 by 2030, thus increasing the need for new residential, commercial, and industrial development and the associated support infrastructure (such as new roads, increased airport use, and greater overall building energy consumption). This growth is expected to occur with or without the Southern Corridor, although the proposed roadway could affect the type and timing of land use along interchanges.

Overall, the growth in the area by the 2030 planning period would likely be the same with or without the Southern Corridor; however, the project would reduce the total vehicle hours traveled in the study area by 8%, thus reducing idling-related emissions of CO and VOCs. Emissions of PM₁₀, NO_x, and SO₂ would increase slightly for the highway network under the build alternatives compared to the No-Build Alternative (see Table 4.8-2 above). Thus, the project is expected to have minor cumulative impacts on regional emissions.

Fugitive Dust. During construction of the project and other developments along the corridor, fugitive dust control measures would be needed in certain areas to protect the disturbed desert soil from wind erosion until permanent, stabilized cover is established. After construction and development are completed, the soil would have a lower potential for wind erosion compared to its undeveloped state.

Vehicle Emissions. Other pollutants such as NO_x, SO₂, and VOCs are considered because they can contribute to urban smog, which can reduce visibility in the urban area and at nearby national parks and wilderness areas. Because the growth in the St. George area is expected to be primarily due to retirees, such emissions are expected to be mostly from mobile sources (vehicles), not industrial sources.

Vehicle emissions have continued to decrease significantly as EPA has imposed a series of tighter emission control requirements on automotive and truck engine emissions. As the region's vehicle fleet becomes newer and the older, high-emitting vehicles are junked, these tighter standards significantly offset the regional growth in vehicle miles traveled. In some urban areas of the country, the tighter emission standards are probably responsible for some nonattainment areas for ozone becoming clean enough to be designated attainment areas according to the EPA NAAQS. While it is difficult to predict fleet-average emissions 20 to 30 years in the future, it is expected that the air quality limitations in larger urban

areas will continue to drive vehicle emissions even lower, thus continuing to offset the growth in vehicle miles traveled.

Visibility. As with many national parks in the U.S., cumulative air emissions could affect the visibility at Zion National Park. Long-range transport of air pollutants from industrial sources and large urbanized areas, increased number of visitors, and increased development in the region and near the park boundary could adversely affect Zion's air quality.

Although Zion does not monitor air quality, park staff and scientists have begun visibility monitoring to develop a baseline and to measure any significant changes. Also, visibility monitoring has been performed at nearby Bryce Canyon National Park for over 10 years (see Section 3.8, Air Quality). The Bryce Canyon data show a slight improvement in visibility during the monitored period.

The National Park Service is working with the appropriate state and federal agencies, industries, nearby communities, land managers, the Southwest Utah Planning Authorities Council, and the Western Region Air Partnership to maintain the air quality of Zion National Park and regional air quality (U.S. Department of the Interior 2001). In addition, UDEQ, Division of Air Quality, is a member of the Western Region Air Partnership and is currently addressing EPA's Regional Haze Rule (64 *Federal Register* 35714) to protect and improve visibility at national parks and wilderness areas. Utah is currently pursuing a Section 309 State Implementation Plan to address impaired visibility and intends to submit it on December 31, 2003. This plan should address regional haze issues that could impair visibility at Zion National Park.

4.8.5.1 Recommendations for Minimizing Cumulative Impacts

To minimize cumulative air quality impacts, a number of measures could be implemented from making vehicle improvements to reducing miles traveled and the number of vehicle trips. Reductions in miles traveled and the number of vehicle trips are related to land use and how local governments plan for future growth. For example, if the cities implemented mixed land use, vehicle miles traveled could be reduced in several ways.

- ***Trip lengths.*** By locating activities closer together, mixed land use can minimize travel distances and improve access to employment, services, and recreation opportunities. In most cases, the average distance per trip driven by residents of mixed-use neighborhoods is half that of residents of single-use neighborhoods.
- ***Mode choice.*** Locating activities closer together allows trips to be made by walking or bicycling rather than driving motor vehicles. In addition, residents can drive to one destination, then walk to others once they have parked.

Reducing the reliance on motor vehicles would benefit local and regional air quality. For more information, see Chapter 6, Smart Growth.

4.9 Noise Impacts

This section discusses traffic noise levels based on monitoring and modeling performed at 11 receptors throughout the project corridor. The majority of the project area consists of undeveloped desert. A few residences (FHWA Activity Category B) along the east and north end of the project area have noise-sensitive receptors. In addition, residential subdivisions that might be developed include Redhawk, Leucadia, Outlaw Ridge, and Dixie Springs.

Table 4.9-1, Modeled Noise Levels at Sensitive Receptors, on page 4-51 shows monitored (existing) noise levels (see Figure 3-11, Southern Corridor Noise Monitoring Locations), modeled (future) noise levels, the change from existing conditions, and the difference between the potential effects of the No-Build and build alternatives.

UDOT defines a noise impact as occurring in either of the following situations:

1. The design noise level exceeds or is within 2 dBA of the noise abatement criterion for the site's activity category (67 dBA for Category B).
2. The design noise level exceeds the existing noise level by 10 dBA or more.

Figure 4-7, Southern Corridor Noise Contour Lines, shows noise contour lines representing modeled 65-dBA traffic noise levels. Appendix G, Noise Readings, provides the distance of the noise contour at various distances from the highway centerline.

The modeling analysis used projected traffic volumes for the year 2030 to depict traffic in the study area. Vehicle volumes and speeds modeled on the build alternatives were based on LOS A–C operations, the worst-case traffic noise conditions because of the free flowing high-speed traffic. LOS A–C conditions would not exist during peak traffic periods but would exist at some point during an average weekday. For more information, see Section 1.3, Corridor Capacity and Level of Service.

4.9.1 No-Build Alternative

Under the No-Build Alternative, as the project area continues to grow without the Southern Corridor, background noise levels in the project area would gradually increase as local and arterial roadways, residences, and commercial and municipal support systems are developed. This development would create noise-sensitive land uses whose occupants would also contribute to the increase in background noise levels. Because the road network would not be substantially different between the No-Build and build alternatives, the noise levels should be similar in the developed area.

It is expected that noise levels near the Southern Corridor under the No-Build Alternative would increase from current levels of 34 dBA to 67 dBA to those of an urban environment of 53 dBA to 75 dBA. However, because no road network and development would likely be built from the Warner Ridge area north to an area just south of the Hurricane city limits, noise levels in that area would be expected to remain between 34 dBA and 54 dBA, compared to 65 dBA near the Southern Corridor under the build alternatives.

4.9.2 Build Alternatives

Under all build alternatives, the project area is expected to continue to develop, and noise levels would increase from those of a rural environment to those of a built environment. Potential noise impacts would be higher than those for the No-Build Alternative. Provided below are the specific noise impacts predicted for each of the build alternatives. Project noise levels and the change from existing conditions for all alternatives are shown in Table 4.9-1, Modeled Noise Levels at Sensitive Receptors, and Figure 3-11, Southern Corridor Noise Monitoring Locations.

4.9.2.1 4300 West Alternative

Modeling results for this alternative indicate that noise levels would meet or exceed the 65-dBA threshold, or would increase by 10 dBA or more, at all seven noise-sensitive receptor locations. The highest increase, 30 dBA, is predicted to occur at Receptor 10, located northwest of the proposed alignment's intersection with Fort Pearce Wash. Noise levels are predicted to increase by 4 to 30 dBA at all receptors. These increases would be caused by the change from a rural environment to a highway.

4.9.2.2 3400 West Alternative

Modeling results for this alternative indicate that noise levels would meet or exceed the 65-dBA threshold, or would increase by 10 dBA or more, at all seven noise-sensitive receptor locations. The highest increase, 30 dBA, is predicted to occur at Receptor 10, located northwest of the proposed alignment's intersection with Fort Pearce Wash. Noise levels are predicted to increase by 4 to 30 dBA at all receptors. These increases would be caused by the change from a rural environment to a highway.

4.9.2.3 2800 West Alternative

Modeling results for this alternative indicate that noise levels would meet or exceed the 65-dBA threshold, or would increase by 10 dBA or more, at all seven noise-sensitive receptor locations. The highest increases are predicted to occur at Receptor 10 (29 dBA) and Receptor 11 (33 dBA). Receptor 10 is located northwest of the proposed alignment's intersection with Fort Pearce Wash, and Receptor 11 is located south of the proposed Sand Hollow Reservoir. Noise levels are predicted to increase by 3 to 33 dBA at all receptors. These increases would be caused by the change from a rural environment to a highway.

Table 4.9-1. Modeled Noise Levels at Sensitive Receptors

Sensitive Receptor Location ^a	Existing	3400 West Alternative			2800 West Alternative			4300 West Alternative		
	L _{eq} (dBA)	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing
1 – Near existing residences along all alternatives at proposed Redhawk subdivision. Mostly undeveloped.	46	69	Yes	+23	68	Yes	+22	69	Yes	+23
2 – Near existing residences and 3400 West Alternative. On Flora Tech Road. Mostly undeveloped.	58	62	No	+4	NA	NA	NA	NA	NA	NA
3 – South of intersection of SR 9 and 2800 West Alternative. Area is undeveloped.	60	NA	NA	NA	70	Yes	+10	NA	NA	NA
4 – At intersection of 3400 West and 2800 West Alternatives. Area is undeveloped.	52	72	Yes	+20	70	Yes	+18	72	Yes	+20
5 – 1,000 feet southeast of River Road near Utah-Arizona border along all proposed alternatives. Area is undeveloped.	62	66	Yes	+4	66	Yes	+4	66	Yes	+4
6 – Near Warner Ridge along 3400 West Alternative. Area is undeveloped.	62	66	Yes	+4	65	Yes	+3	66	Yes	+4
7 – Southern end of 4300 West Alternative. Mostly undeveloped farmland except for several residences.	61	65	Yes	+4	NA	NA	NA	67	Yes	+6
8 – At intersection of SR 9 and 4300 West Alternative. South side of SR 9 at monitoring location is undeveloped; north side of SR 9 includes trailer park and gas station.	67	NA	NA	NA	NA	NA	NA	72	Yes	+5
9 – On 3400 West Alternative north of proposed Dixie Springs subdivision. Area is undeveloped.	42	67	Yes	+25	NA	NA	NA	NA	NA	NA

Sensitive Receptor Location ^a	Existing	3400 West Alternative			2800 West Alternative			4300 West Alternative		
	L _{eq} (dBA)	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing
10 – Northwest of proposed intersection with Fort Pearce Wash. Area is undeveloped.	34	64	Yes	+30	63	Yes	+29	64	Yes	+30
11 – South of the proposed Sand Hollow Reservoir along 2800 West Alternative. Area is undeveloped.	34	NA	NA	NA	67	Yes	+33	NA	NA	NA

^a Figure 3-11, Southern Corridor Noise Monitoring Locations, shows the location of the sensitive receptors.

4.9.3 Mitigation Measures

4.9.3.1 Feasibility

Mitigation measures were evaluated according to the pending UDOT Noise Abatement Policy 08A2-1. Under this policy, the Southern Corridor would be considered a Type I project and would be considered for noise abatement. For abatement consideration, the following conditions must be satisfied:

1. Project-related noise levels must be 65 dBA or more at sensitive receptors or must increase by at least 10 dBA.
2. Mitigation must provide a reduction in projected noise levels of at least 5 dBA.
3. The cost per residence for installation of noise abatement measures, not including other direct costs (such as new ROW acquisition, landscaping, irrigation, and safety barrier installation), must not exceed the abatement limit, which was \$20,000 at the time of this analysis.
4. Public opinion would be a consideration for noise abatement.
5. A new or proposed subdivision or other development must have a recorded plat prior to the earlier of the following: 1) the earliest environment approval date of the highway improvement as per completion of the EIS or record of decision or highway design, or 2) the date the local general plan or master plan has designated for major highway improvements.

Both the proposed Dixie Springs and Redhawk subdivisions were platted before the Southern Corridor was shown in the local master plans, and thus both meet the fifth criterion. These subdivisions were investigated further regarding the need for possible mitigation options. However, neither subdivision has been developed and these areas currently consist of desert.

4.9.3.2 Methodology

To identify the need for mitigation, the first receptors in the proposed Dixie Springs and Redhawk subdivisions that would be located next to the Southern Corridor were modeled. Results of this modeling are presented in Table 4.9-2.

Table 4.9-2. Modeled Noise Levels at Subdivision Receptors

Sensitive Receptor Location	Existing	3400 West Alternative			2800 West Alternative			4300 West Alternative		
	L _{eq} (dBA)	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA)	Exceeded Standard?	Change from Existing
Dixie Springs 1	42	58	No	+16	NA	NA	NA	NA	NA	NA
Dixie Springs 2	42	57	No	+15	NA	NA	NA	NA	NA	NA
Dixie Springs 3	42	57	No	+15	NA	NA	NA	NA	NA	NA
Dixie Springs 4	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dixie Springs 5	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dixie Springs 6	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dixie Springs 7	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dixie Springs 8	42	63	No	+21	NA	NA	NA	NA	NA	NA
Dixie Springs 9	42	60	No	+18	NA	NA	NA	NA	NA	NA
Dixie Springs 10	42	56	No	+14	NA	NA	NA	NA	NA	NA
Dixie Springs 11	42	62	No	+20	NA	NA	NA	NA	NA	NA
Dixie Springs 12	42	56	No	+14	NA	NA	NA	NA	NA	NA
Dixie Springs 13	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dixie Springs 14	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Redhawk 1	46	50	No	+4	49	No	+3	50	No	+4
Redhawk 2	46	50	No	+4	49	No	+3	50	No	+4
Redhawk 3	46	57	No	+11	56	No	+10	57	No	+11
Redhawk 4	46	56	No	+10	55	No	+9	56	No	+10
Redhawk 5	46	59	No	+13	58	No	+12	59	No	+13
Redhawk 6	46	51	No	+5	50	No	+4	51	No	+5
Redhawk 7	46	58	No	+12	57	No	+11	58	No	+12

All receptors that would be next to the Southern Corridor were under the UDOT noise abatement criterion of 65 dBA. However, some receptors were predicted to increase by 10 dBA or more (including the proposed Dixie Springs subdivision), so mitigation measures were evaluated.

Neither of the proposed subdivisions nor the Southern Corridor have been built; therefore, detailed mitigation analyses are impractical. UDOT should perform a detailed mitigation analysis during the final design phase of the Southern Corridor if these residential developments are sufficiently advanced.

When noise abatement measures are being considered, every reasonable effort should be made to substantially reduce noise. At a minimum, 5 dBA of noise reduction must be achieved at residences nearest the highway. For this EIS, a noise wall at the proposed Dixie Springs subdivision was modeled (Table 4.9-3). A noise wall near the subdivision would reduce noise levels by 9 to 12 dBA.

Table 4.9-3. Modeled Noise Levels at Proposed Dixie Springs Subdivision Receptors

Sensitive Receptor Location	Existing	3400 West Alternative— Dixie Springs			3400 West Alternative— Dixie Springs with 20-foot Wall		
	L _{eq} (dBA)	2030 L _{eq} (dBA) ^a	Exceeded Standard?	Change from Existing	2030 L _{eq} (dBA) ^a	2030 L _{eq} with Barrier (dBA)	Change with 20-ft Wall (dBA)
Dixie Springs 1	42	58	No	+16	60	51	-9
Dixie Springs 2	42	57	No	+15	61	50	-11
Dixie Springs 3	42	57	No	+15	62	50	-12
Dixie Springs 8	42	63	No	+21	65	54	-11
Dixie Springs 9	42	60	No	+18	62	52	-10
Dixie Springs 10	42	56	No	+14	60	49	-11
Dixie Springs 11	42	62	No	+20	63	53	-10
Dixie Springs 12	42	56	No	+14	62	51	-11

^a Note the difference in 2030 L_{eq} (dBA) before and after the wall was modeled. The sound levels differ between 1 and 6 dBA. This is a function of how the traffic noise model interprets the ground elevations.

4.9.4 Cumulative Impacts

The project area has been changing from a rural desert environment to a more urban setting. Noise levels in the urban areas of St. George, Washington City, and Hurricane have steadily increased to typical noise levels for cities. Potential cumulative impacts to noise would occur from the Southern Corridor and from changes due to the new airport and residential, commercial, and industrial development. The geographical boundary for this analysis includes the undeveloped and developed parts of the Washington County urbanized area.

Current noise levels in the area of the proposed Southern Corridor range from 34 dBA (undeveloped desert) to 67 dBA (next to SR 9). This is the baseline for the cumulative impact analysis. Typically, noise levels above 65 dBA are considered unacceptable for most sensitive receptors (such as residential areas and schools). Table 4.9-4 provides typical noise levels for rural and urban environments.

Table 4.9-4. Typical Noise Levels in Rural and Urban Areas in the United States

Area	Typical Range of dB	Average Census Tract Population Density (people/sq. mile)
Wilderness and rural	16–35	Zero to little population
Quiet suburban residential	48–52	630
Normal suburban residential	53–57	2,000
Urban residential	58–62	6,300
Noisy urban residential	63–67	20,000
Very noisy urban residential/ downtown city	68–75	63,000
Sources: Cooper Engineering 1985; Canter 1996		

Noise levels in southern Washington County have steadily increased from those of a rural area to a suburban residential area as the land uses have changed from an undeveloped desert to a small city. By the 2030 planning period, the study area would likely be developed to include more residential, commercial, and industrial land uses.

Background noise levels in the area would gradually increase as roadways, residences, and commercial and municipal support systems are developed. These land use changes would result in a cumulative noise impact in which noise levels would change from rural and suburban residential (34 to 57 dBA) to urban residential and noisy urban residential (58 to 75 dBA). A change of 10 dBA in the noise environment would be perceived as a doubling of the current noise loudness.

Results of this analysis indicate that cumulative traffic noise impacts could occur if residences or other sensitive receptors such as schools are developed next to the Southern Corridor. It is expected that once the areas next to the Southern Corridor are developed, they could experience cumulative noise levels between 63 and 75 dBA—those of a busy urban environment. Responsible land use planning by the cities and developers in the project area, such as planning nonresidential land uses near the Southern Corridor, could alleviate this possibility. If the municipal and county planning organizations do not plan to

minimize cumulative impacts, developers might need to evaluate and implement noise mitigation options on their own.

One of the largest concerns for cumulative noise impacts is the proposed St. George Regional Airport. A recent Environmental Assessment evaluated the potential for impacts from this airport. The 60-dBA A-weighted day-night equivalent sound level (L_{dn}) contour model for the airport is close to the airport boundary and does not approach I-15 or likely locations of noise-sensitive receptors along the Southern Corridor.

The predicted 60-dBA L_{dn} contour lies within 1 mile of the Southern Corridor. Assuming the project area is completely developed, traffic noise from the Southern Corridor should not be audible at the airport above background noise levels. Airport noise would dominate during aircraft overflight, and background noises (such as traffic on local roads) would produce noise levels typical of an urban environment (58 to 67 dBA). Therefore, no cumulative impacts from the Southern Corridor should occur. However, responsible land use planning by the developers in the project area can alleviate potential noise impacts by placing nonresidential (non–Category B) land uses near both the proposed airport and the Southern Corridor.

4.9.4.1 Recommendations for Minimizing Cumulative Impacts

Potential cumulative noise impacts to sensitive receptors could be minimized by appropriate land use planning. Local cities and developers should review development plans to determine the location of noise generators, such as the St. George replacement airport and the Southern Corridor, to determine appropriate nonresidential land uses for these areas.

4.10 Water Quality Impacts

This section describes the potential water quality impacts on surface water and groundwater for the Southern Corridor alternatives and the cumulative impacts on both surface water and groundwater quality anticipated from the expected growth in the area.

4.10.1 Contaminants Evaluated

Typical contaminants from highway runoff are listed in Table 4.10-1.

Table 4.10-1. Typical Highway Runoff Contaminants

Contaminant	Source
Total dissolved solids (TDS)	De-icing salts, vehicle deposits, pavement wear
Heavy metals (copper, lead, zinc)	Vehicle deposits
Chlorides, sodium, calcium	De-icing salts
Cyanide	Anticake compound used to keep de-icing salts granular
Petroleum	Vehicle spills and leaks from lubricants, antifreeze, hydraulic fluids
Pathogenic bacteria	Soil, litter, trucks hauling livestock
Rubber	Tire wear
Sediments (TSS)	Construction activities, vehicle deposits, pavement wear
Source: FHWA 1987a	

As mentioned in Chapter 3, Affected Environment, the Virgin River is on the state's 303 (d) list of impaired waters for consistently exceeding the standard for TDS. Because of this listing, UDEQ is required to conduct a total maximum daily load analysis to determine the pollutant source(s) and pollutant reduction strategies. The total maximum daily load analysis could show that the TDS and sediment concentrations are naturally occurring, the water quality standard cannot be met without a substantial financial investment, and the Virgin River needs to be reclassified (Pitkin 2001).

The *Virgin River Basin—Utah Cooperative Study* identified five geographic areas of the basin as yielding a high percentage of the total sediment in the Virgin River. This study also identified La Verkin Springs as a source of TDS in the Virgin River, since the TDS concentration in these springs is over 9,000 mg/L (U.S. Department of Agriculture 1990).

High sediment loads associated with spring runoff, storm events, and channel erosion are also reported in the Virgin River. UDEQ believes that sediment loading (total suspended solids, or TSS) might be the primary source of the TDS and chloride problems in the river. TSS is a measure of the amount of sediment

and other undissolved pollutants in water. Although no numeric standard exists, TSS was selected as a primary contaminant of concern for the Southern Corridor project. The largest potential source of sediment load to receiving waters would occur during highway construction, would be temporary in nature, and would be controlled by control devices. Heavy metals are also prevalent in highway storm water runoff and are, therefore, a contaminant of concern.

Typically, the primary source of TDS and chloride pollution in highway storm water runoff is de-icing salts. The TDS loading on receiving waters around the Southern Corridor is expected to be minimal because the Southern Corridor is located in a region where snowfall and prolonged periods of freezing temperatures are rare and de-icing salts are not typically used. Based on past experience, UDOT anticipates only one storm event per year that will require snow removal and de-icing salts (Merrill 2002). Therefore, TDS and chlorides were eliminated as contaminants of concern for the Southern Corridor project.

4.10.2 Surface Water

Overall, no direct impacts to the water quality of the Virgin River or other surface water sources are expected from the Southern Corridor, although indirect impacts from the expected population growth in the Virgin River Basin could adversely affect water quality.

4.10.2.1 No-Build Alternative

Development throughout the study area will occur over the next 30 years and will include residential, commercial, and industrial developments and associated transportation facilities. An increase the amount of impervious surfaces will change the local runoff characteristics and could affect water quality.

Local planners have indicated that, overall, there would be no substantial difference in the local road network and planned land uses under the No-Build Alternative compared to the build alternatives. Table 4.0-1 above, Acres of New Roadways, No-Build and Build Alternatives, shows that the number of major roadways that would be needed (new roadways or expansion of existing roadways) without the project would be only slightly less than with the project.

Of the 87,700 acres of land available for development, about 23,000 acres would be used for roadways and highways (see Table 4.0-1 above). Under the No-Build Alternative, about 250 additional acres of major roadways would be needed in lieu of the Southern Corridor. This is a small percentage of the total amount of land available for development. The incremental runoff and associated pollutant loadings from the additional roadway acreage is insignificant compared to the

total amount of storm water runoff and pollutant loadings from existing and future development in the Washington County urbanized area.

4.10.2.2 4300 West Alternative

This alternative would cross the Fort Pearce Wash and parallel the Atkinville Wash in the southern part of the study area, and would parallel the Virgin River in the northern part of the study area near the point where the alternatives separate. At its closest, the Virgin River is about 700 feet from this alternative. The FHWA document *Effects of Highway Runoff on Receiving Waters* (FHWA 1985) concludes that water quality effects from highway storm water runoff are generally minimal due to the following factors:

- The highway ROW is small in proportion to the total watershed.
- Pollutant loads are diluted because they are generated during storms or by snowmelt, which result in high stream flows.

Additionally, the FHWA technical paper *Sources and Migration of Highway Runoff Pollutants* (FHWA 1987a) concludes that normal ecosystem processes are generally affected only in areas that are within 15 feet of the highway, and that elevated levels of sodium and metals in soil do not extend beyond 100 feet from the edge of the pavement. Because vegetation can be somewhat limited in the area of the proposed Southern Corridor, the effects of highway runoff might extend farther from the ROW.

Dry Washes

All waters not specifically listed in the State Standard are given the default classifications 2B (protected for secondary contact recreation such as boating, wading, or similar uses) and 3D (protected for water-oriented wildlife... including the necessary aquatic organisms in their food chain) (UAC R317-2). Because there are no steady sources of water in the dry washes, there is no recreation associated with the area washes, including the Atkinville and Fort Pearce Washes. Therefore, the water quality standards for Class 2B waters do not apply. In addition, because these washes do not support aquatic wildlife, the numeric water quality standards for Class 3D waters do not apply.

Virgin River

A probabilistic dilution model was used to predict water quality impacts to the Virgin River. This model is explained in the FHWA documents *Pollutant Loadings and Impacts from Highway Storm Water Runoff* (FHWA-RD-88-006) and *Retention, Detention, and Overland Flow for Pollutant Removal from Highway Storm Water Runoff* (FHWA-RD-96-095). Typical concentrations of pollutants in highway storm water runoff are site median values for an urban site taken from EPA's National Urban Runoff Program (EPA 1993).

Because highway storm water runoff flows and pollutant concentrations are variable, as are Virgin River flow rates and in-stream pollutant concentrations, statistical methods are used to predict downstream Virgin River water quality. UDEQ allows water quality standards to be exceeded once every three years; these once-every-three-years downstream pollutant concentrations are presented in Table 4.10-2.

Table 4.10-2. Downstream Virgin River Pollutant Concentrations

Pollutant	Alternative ^a				UDEQ Acute (1-hour) Standard
	Existing ^b	4300 West	3400 West	2800 West	
Copper (µg/L) ^c	9	16	13	12	18
Lead (µg/L) ^c	1	11	8	7	82.0
Zinc (µg/L) ^c	22	71	55	51	120.0
TSS (mg/L)	1,329 ^d	1,128	1,200	1,226	NS

Values are the once-every-three-years pollutant concentrations and are rounded to nearest integer.

NS = No standard

µg/L = micrograms per liter

^a Build alternative values include the existing Virgin River pollutant levels.

^b Calculated based on 1998–2000 Virgin River data.

^c Pollutant not detected in the historic record; one-half detection limit used as the actual in-stream concentration.

^d Does not include TSS contributions from project area under existing conditions.

The Southern Corridor would not affect the beneficial use classifications of the Virgin River (2B, 3B, and 4).

- Classification 2B is for secondary contact recreation such as boating, wading, or similar uses (UAC R317-2). The 2B classification limits TSS concentrations to 90 mg/L. The Southern Corridor would not increase the already high TSS concentrations in the Virgin River (277 mg/L average). The value in Table 4.10-2 is the predicted once-every-three-years concentration.
- Classification 3B is for the protection of warm-water species of game fish and other warm-water aquatic life, including the necessary aquatic organisms in their food chain (UAC R317-2). UDEQ establishes numeric criteria to protect aquatic wildlife from chronic and acute exposures to toxic pollutants. The primary toxic chemicals found in highway storm water runoff are heavy metals, specifically copper, lead, and zinc. As shown above in Table 4.10-2, the resulting Virgin River water quality would not exceed water quality standards for these pollutants.
- Classification 4 is for the protection of water use for agricultural purposes including irrigation of crops and stock watering (UAC R317-2). The main contaminants of concern for this classification are TDS and chlorides. As mentioned above, soil erosion is believed to be the main source of TDS and chloride problems in the Virgin River. An increase in paved surfaces will reduce soil erosion (TSS) and potentially decrease TDS and chloride concentrations in the Virgin River.

Table 4.10-2 above presents estimates of resulting Virgin River water quality. Table 4.10-2 shows that the Southern Corridor will not exceed the state standards for the pollutants studied, despite the fact that no storm water runoff treatment measures were considered. Southern Corridor design would include roadside ditches and detention ponds to retain all highway storm water runoff for a 10-year storm event. For storms of larger magnitude, runoff would be discharged to area washes, and ultimately to the Virgin River, only after passing through a detention pond or ditch. The benefit of detention would be to remove sediments (TSS), TDS, chlorides, metals, and other pollutants and improve discharge water quality. In addition, as mentioned above, any negative effects of highway storm water runoff from a storm larger than a 10-year event would be diluted by elevated Virgin River flow rates.

Construction activities such as excavation, grading, or equipment staging could also erode soil and temporarily increase sediments in receiving waters. Sediment loadings would decrease when construction is completed and when permanent

protective measures are established to stabilize the ROW and the construction staging areas.

Although the Southern Corridor itself is not expected to degrade surface water quality, indirect impacts from the expected population growth in the Virgin River Basin could adversely affect water quality. The expected growth would require development of additional high-quality water resources for public use. Continued development of these resources could further reduce stream flows and increase the potential for storm water runoff from developing areas to affect water quality.

Point and Nonpoint Source Pollution. Point source and nonpoint source pollution could increase if controls are not incorporated to treat the water quality of storm water runoff from developing areas. Phase II of the UPDES program would require storm water discharge permits, which include pollutant concentration limitations for smaller construction sites and smaller municipal storm drains. Typically, zoning ordinances were developed before nonpoint source control became a major concern. Including local community planners and policy makers in the watershed approach would encourage the implementation of storm water runoff treatment ordinances as an integral part of the permitting process.

As an example, the City of St. George is now requiring all new developments that exceed 1 acre and all new commercial developments to submit a drainage control plan. This plan must incorporate measures to protect any downstream water courses from eroded sediments. These measures must be permanent unless otherwise approved (City of St. George, no date).

Hazardous Material Spills. Water quality can also be affected by a hazardous material spill. Hazardous spills depend more on the number of industries in an area than on traffic volumes. An accidental spill of a large quantity of hazardous material could affect surface waters if it is not immediately contained and cleaned up.

Immediate appropriate action by the person responsible for a spill minimizes its impact on water quality. UAC R315-9 mandates a spill response procedure for immediate cleanup of the spilled material and residue and any contaminated material. The responsible individual can choose which spill response resource to call. The Utah Highway Patrol, usually the first agency on the scene, maintains a list of private organizations available to respond to and clean up the spill. The responsible individual must then immediately notify UDEQ of the time and location of the spill, the type and amount of the spilled material, the cause of the spill, and the action taken. If the responsible party takes no action, UDEQ can take action and bill the responsible party.

4.10.2.3 3400 West Alternative

Potential water quality impacts from this alternative would be similar to those for the 4300 West Alternative. Although this alternative is also 700 feet from the Virgin River at its closest point, the interchange with SR 9 is farther away than under the 4300 West Alternative. Therefore, the potential for this alternative to adversely affect water quality would be less than that of the 4300 West Alternative. Because the alignments are the same, the impacts to the dry washes in the southern part of the study area would be the same as those under the 4300 West Alternative.

4.10.2.4 2800 West Alternative

Potential water quality impacts from this alternative would be similar to those for the 4300 West Alternative, except that this alternative is farthest from the Virgin River and therefore would have the least impact on surface water. Like the other two build alternatives, this alternative is about 700 feet from the Virgin River at its closest point. Because the alignments are the same, the impacts to the dry washes in the southern part of the study area would be the same as those under the 4300 West Alternative.

4.10.2.5 Mitigation Measures

All build alternatives would disturb more than 1 acre during construction. Therefore, a UPDES permit would be required. This permit would stipulate that the contractor design and implement measures, including BMPs, to limit the amount of eroded sediment that leaves the work area. BMPs would include the use of UDOT standard drawings for temporary erosion control (Drawings 1010–1014A in UDOT Standard Specifications). The Southern Corridor’s design includes roadside ditches and retention basins designed to retain all runoff from a 10-year storm event.

4.10.3 Groundwater Quality

The consolidated rock aquifers (Navajo and Kayenta) provide most of the potable water to the municipalities in Washington County. The expected population growth in the area would drive the need for further development of existing groundwater.

4.10.3.1 No-Build Alternative

Under the No-Build Alternative, recent trends in developing groundwater resources of the shallow and principal aquifers would continue to support development. For this development, local roads would be built throughout the

area, creating about 400 acres of additional impervious surface and potentially affecting groundwater resources. Due to the relatively small surface area affected by these projects compared to the overall extent of an aquifer, these projects would cause minimal direct or indirect impacts to groundwater quality.

4.10.3.2 4300 West Alternative

Runoff both during and after construction could potentially infiltrate the soil and reach any shallow aquifers. Due to the relatively small surface area affected by the Southern Corridor compared to the overall extent of an aquifer, the new road would cause minimal direct or indirect impacts to groundwater quality.

4.10.3.3 3400 West Alternative

Potential impacts from this alternative to groundwater quality would be the same as those for the 4300 West Alternative.

4.10.3.4 2800 West Alternative

Potential impacts from this alternative to groundwater quality would be the same as those for the 4300 West Alternative.

4.10.4 Groundwater Rights and Wells

The Water Rights Division of the Utah Department of Natural Resources (UDNR) tracks groundwater rights by inventoried water right numbers. The locations corresponding to a water right number are shown in Figure 3-13, Groundwater Well Locations. The locations of the wells are approximate and could be one well or cluster of wells. The Utah Division of Drinking Water maintains records of all municipal wells with approved Drinking Water Source Protection Plans. See Section 3.10.4, Groundwater Rights and Wells, for more information.

4.10.4.1 No-Build Alternative

Under the No-Build Alternative, about 15 non-drinking water wells would be affected. In addition to the groundwater wells, this alternative would include land within the protection zones of four municipal wells: Hurricane Valley Wells 1 (Old, West) and 2 (New, East) and Hurricane City Stratton Wells 1 and 2. According to UAC R309-113, owners of municipal drinking water wells are required to prepare a Drinking Water Source Protection Plan. This plan identifies different land management approaches for the four distinct groundwater source protection zones. Local officials would have to review any development plans

that fall within the protection zones to determine if the plans are consistent with established management approaches.

4.10.4.2 4300 West Alternative

Wells located within the Southern Corridor ROW would be affected because the owner would not be able to maintain ownership there. Table 4.10-3 lists the number of groundwater wells affected by the Southern Corridor; also see Figure 4-8, Potentially Affected Wells. Under this alternative, 14 wells would be potentially affected.

Table 4.10-3. Number of Potentially Affected Groundwater Wells

Alternative	Affected Wells
4300 West	14
3400 West	19
2800 West	8

4.10.4.3 3400 West Alternative

Under this alternative, 19 groundwater wells would be potentially affected.

4.10.4.4 2800 West Alternative

Under this alternative, 8 wells would be potentially affected. In addition to the groundwater wells, this alternative would include land within the protection zones of four municipal wells: Hurricane Valley Wells 1 (Old, West) and 2 (New, East) and Hurricane City Stratton Wells 1 and 2.

4.10.4.5 Mitigation Measures

For wells within the ROW, UDOT would either purchase the groundwater right from the owner or pay for a transfer of the right. Coordination would take place with owners of municipal wells to determine if the highway is consistent with the land management approach established in their Drinking Water Source Protection Plan for each of the four source protection zones.

4.11 Impacts on Wetlands/Waters of the U.S.

Section 3.11, Wetlands/Waters of the U.S., identified existing seasonal washes/drainages (ephemeral streams) in the project area and one spring with an associated channel. This section describes potential impacts to these waters according to the following categories:

- Direct impacts are short-term impacts during construction of the highway involving highway footprint, berm, and trail system within wetland boundaries.
- Indirect impacts are any long-term possible effects on waters as a result of the constructed highway.

As a result of the dry climate and soil conditions, few wetlands (nonjurisdictional and jurisdictional) or natural springs exist in the study area. The main wetland areas in the region are associated with the Virgin River flood channel, which is outside the study area for direct wetland impacts.

4.11.1 No-Build Alternative

The study area where many of the No-Build Alternative arterial roads would be developed has not been surveyed for wetlands. However, given the dry climate, most wetlands in the area are associated with springs, and no springs exist where the future arterial roads would be developed. Therefore, no direct impacts to wetlands are anticipated.

A few roads, such as 2450 East, might require widening at the Virgin River crossing, which could cause temporary impacts to wetlands. Given the number of dry washes in the study area, the local transportation improvements under this alternative would affect areas considered waters of the U.S. Local roads could affect areas such as the Fort Pearce Wash; one such road would be located in southern St. George and would connect to the replacement airport. It is expected that such roads would be built to maintain the hydraulic capacity of the wash.

Development, including associated local roads and other infrastructure improvements, could cause indirect impacts to waters of the U.S., namely seasonal washes/drainages. In addition, converting farmlands to residential and commercial use could affect some irrigation canals that support wetland vegetation. Such development effects are not quantifiable at this time, since the specific characteristics of the development and location of such wetland areas are not known. These effects would be similar under the build alternatives.

4.11.2 Build Alternatives

The study area was surveyed to determine the extent of both jurisdictional and nonjurisdictional wetlands. The results of the field survey were documented and approved by COE on October 6, 2000 (Entranco 2000). An addendum to this report that included new alignments was also submitted (HDR 2001c). Because of the dry desert environment, most of the study area consists of seasonal dry washes/drainages and a few natural springs. Since no direct impacts to wetland areas are expected, preliminary coordination with COE has determined that a Nationwide 14 permit for linear transportation crossings would be acceptable for this project (see Appendix C, Pertinent Correspondence).

Executive Order 11990, Protection of Wetlands, directs federal agencies to avoid the following impacts to the extent possible:

- The long- and short-term adverse impacts associated with modifying or filling wetlands
- Direct and indirect support of construction in wetlands unless there is no practical alternative to such construction and the proposed action includes all measures to minimize harm to the wetlands

Initially, the 4300 West and 3400 West Alternatives crossed over the Willow Springs wetland area. Both alternatives were later modified to avoid this wetland by 450 feet.

4.11.2.1 4300 West Alternative

Under the 4300 West Alternative, there are numerous seasonal washes/drainages in the study area that could be directly affected. Dry washes/drainages would be crossed in a way that allows proper drainage and capacity for a 100-year flood. Fort Pearce Wash is the major drainage and a main collector during flash flood events, and at the Southern Corridor the crossing is about 245 feet wide. The roadway at this location would be designed to span the riparian area and accommodate hydraulic capacity for a 100-year flood. The abutments would be outside the riparian area.

No indirect impacts to waters of the U.S. or Willow Springs are anticipated from the Southern Corridor, since flows into waters of the U.S. would be controlled to maintain the hydraulic capacity of the dry washes/drainages. Indirect impacts from developments would be similar to those under the No-Build Alternative. Because the Southern Corridor would be located 450 feet down-gradient from Willow Springs, no indirect impacts are anticipated. In addition, given the rough topography of the area, no development is expected.

4.11.2.2 3400 West Alternative

The impacts to seasonal washes/drainages, including Fort Pearce Wash, would be similar to those for the 4300 West Alternative.

4.11.2.3 2800 West Alternative

The impacts to seasonal washes/drainages, including Fort Pearce Wash, would be similar to those for the 4300 West Alternative, but this alternative would cross more dry washes.

4.12 Water Body Modification and Wildlife Impacts

4.12.1 Water Bodies

4.12.1.1 No-Build Alternative

Potential impacts to water bodies are analyzed in Section 4.10, Water Quality Impacts. Given the few water bodies in the project area, impacts to water quality would be limited. Under the No-Build Alternative, the addition of arterial streets is not anticipated to affect water bodies that support wildlife. Some roads that cross the Virgin River might be expanded to handle the future increase in traffic. To minimize impacts in the region and promote the goals of protecting the Virgin River, the Virgin River Management Plan was sponsored by WCWCD in conjunction with state and federal agencies, Washington County, local cities, environmental groups, and the Shivwits Band of the Paiute Indian Tribe (WCWCD 1999).

4.12.1.2 4300 West Alternative

The Virgin River is the only year-round surface water body in the project area. The other water bodies are Willow Springs and dry washes that flow during storm events. The Southern Corridor does not affect any springs in the project area. The 4300 West Alternative is projected to be 700 feet from the Virgin River at one point before it moves to the east. During construction, BMPs to control runoff would minimize potential impacts to water quality and wildlife habitat. In addition, it is not expected that operation of the Southern Corridor would affect Virgin River water quality. See Section 4.10, Water Quality Impacts, for a detailed discussion.

4.12.1.3 3400 West Alternative

Potential impacts to water bodies under this alternative would be the same as those for the 4300 West Alternative.

4.12.1.4 2800 West Alternative

Potential impacts to water bodies under this alternative would be the same as those for the 4300 West Alternative.

4.12.2 Wildlife Habitat

4.12.2.1 No-Build Alternative

Under the No-Build Alternative, about 400 acres of major roadway pavement would be required. About 345 acres of this would be new road alignments. The vegetation in the area consists of a mixture of warm and cold desert scrub. Constructing these roads would involve removing and altering habitat during construction. Overall impacts would be similar to those described for the build alternatives, except that less habitat would be lost. Most of the habitat would be within the boundary of St. George, Washington City, and Hurricane, some of which has been previously degraded by heavy OHV use, cattle grazing, and other activities. The No-Build Alternative would not result in the loss of any habitat next to Warner Ridge.

Indirect impacts could occur from growth and development in the area. By the 2030 planning period, about 84,700 acres could be developed in the urbanized areas of Washington County. This development would eliminate desert scrub habitat and further reduce the connections between natural habitats on public land south and north of the study area. However, large tracts of land (such as the 61,022-acre Red Cliffs Desert Reserve) have been set aside to maintain high-quality habitat while allowing growth in the area.

In addition, to minimize impacts in the area, BLM is working with affected interests to ensure that important wildlife habitat areas are maintained on public and private lands. BLM will manage suitable public land habitats for recovery or reestablishment of native populations through collaborative planning with local, state, and federal agencies, user groups, and interested organizations. BLM will also seek to limit additional adverse impacts to crucial habitats on public lands from urbanization and encroachment to preserve the integrity of wildlife corridors and migration routes and access to key forage, nesting, and spawning areas (BLM 1998).

4.12.2.2 4300 West Alternative

Vegetation in the Southern Corridor project area consists of a mixture of warm and cold desert scrub and desert riparian scrub. The Southern Corridor would result in removing and altering habitat during construction (Table 4.12-1). In

addition, about 150 acres of new pavement would be added by the local cities to support development, most of which would be new alignment.

Table 4.12-1. Acres of Desert Scrub/Desert Riparian Scrub Affected

	4300 West Alternative	3400 West Alternative	2800 West Alternative
Acres affected	675	735	928

Potential direct impacts include changes in plant community composition (kind), changes in plant structure (life form), and possibly weed invasion. Indirect impacts can include habitat degradation induced by erosion, sedimentation, and contaminants from highway runoff. Because the ultimate growth would be similar to the No-Build Alternative, indirect impacts to wildlife habitat would be similar to those for that alternative. Other indirect impacts on wildlife and their habitat are discussed in Section 4.12.4, Indirect Impacts on Wildlife.

Impacts on habitat are considered substantial if loss of an important plant community alters the function of the ecosystem. Impacts could be either long-term, such as a permanent loss of habitat, or short-term, assuming the habitat is reclaimed and revegetated after highway construction.

The desert scrub community provides habitat for a variety of large mammals, birds, reptiles, and amphibians (see Section 3.12, Water Body Modification and Wildlife). The Southern Corridor would affect a small amount of this overall habitat during construction. Much of the habitat along the proposed Southern Corridor has been previously degraded by heavy OHV use, cattle grazing, and other activities.

The Southern Corridor crosses desert scrub riparian habitat at Fort Pearce Wash but avoids the floodplains of the Virgin River. At Fort Pearce Wash, the riparian area would be spanned by a structure, therefore minimizing potential impacts.

Invasive Species. As directed by the invasive species Executive Order 13112 (February 3, 1999), all federal agencies are required to expand and coordinate efforts to combat the introduction and spread of invasive species. FHWA has developed guidance to implement this order through state transportation department agencies. The following is the UDOT policy on control of invasive species during construction of projects (UDOT 2000):

- Verify that all earthmoving equipment and vehicles have been cleaned of dirt, mud, and seed before entering and after leaving a project worksite infested with noxious weeds.
- Avoid any unnecessary disturbance of project areas known to be infested with noxious weeds.
- Minimize soil disturbance within the ROW.
- Control and monitor gravel, borrow, and topsoil sources and stockpiles for noxious weeds; use pre-emergent, selective, and nonselective herbicides as appropriate.
- Eradicate invasive weeds by inspecting and monitoring erosion control disturbed soils; use pre-emergent, selective, and nonselective herbicides as appropriate.

Invasive weeds exist in the project area and construction would likely cause an increase in these species. These species include red brome (*Bromus rubens*), cheat grass (*Bromus tectorum*), and filaree (*Erodium cicutarium*).

4.12.2.3 3400 West Alternative

Potential impacts to wildlife habitat under this alternative would be similar to those for the 4300 West Alternative, except that this alternative would affect an additional 60 acres.

4.12.2.4 2800 West Alternative

Potential impacts to wildlife habitat under this alternative would be similar to those for the 4300 West Alternative, except that this alternative would affect an additional 253 acres.

4.12.2.5 Mitigation Measures

Mitigation would include minimizing impacts to habitat by removing only vegetation that occurs within the construction ROW. Reclamation and revegetation would occur during road construction.

UDOT would follow specifications outlined in Section 01574 of the *1999 Metric Standard Specifications for Road and Bridge Construction* (UDOT 1999a) to minimize construction impacts from the Southern Corridor and manage the ROW for invasive species.

4.12.3 Direct Impacts on Wildlife

4.12.3.1 No-Build Alternative

Under the No-Build Alternative, about 400 acres of major roadway pavement would be required. About 345 acres of this would be new road alignments. These additional roads would cause fragmentation and loss of wildlife habitat, a reduction in water quality, loss of food sources, and temporary and permanent displacement and incidental mortality of resident wildlife species. The impacts would be similar to those for the build alternatives, except that this alternative would require about 425 to 678 fewer acres. Under the No-Build Alternative, local roads could also affect the golden eagle nest near the Sand Mountain area.

4.12.3.2 4300 West Alternative

The Southern Corridor project would result in the loss and alteration of wildlife habitat. Direct impacts would include the loss of food sources and cover, temporary and/or permanent displacement, fragmentation of habitat, and incidental mortality of resident wildlife species. Some habitats might be at carrying capacity while others might not; this means some species would be able to relocate and survive while others would be competitively excluded.

Mammals. Most of the project area is considered low-quality habitat for large mammals such as mule deer. Other mammals such as coyote, bobcat, raccoon, kit fox, badger, and ringtail cat occur in limited numbers in the project area. Because large mammals are more mobile, no direct mortality from construction is expected. However, smaller, less mobile mammals could be directly affected during construction. In addition, the Southern Corridor would result in the fragmentation of habitat for species that use the area next to the highway. For more information, see Section 4.12.4, Indirect Impacts on Wildlife.

Reptiles and Amphibians. Most of the project area is considered suitable habitat for a number of desert-dwelling lizards and snakes. Mortality is likely to occur to the more common lizards and snakes, such as the desert spiny lizard, western whiptail lizard, and gopher and garter snakes. These reptiles use small openings under shrubs and grasses and are expected to be affected during construction. Moist habitats suitable for amphibians are uncommon along the Southern Corridor, and mortality is expected to be minimal for common species such as the spadefoot toad.

Birds. Cliff-nesting raptor species that were directly observed in the project area include red-tailed hawks, American kestrels, prairie falcons, and great horned owls. Common ravens were also abundant. Impacts to raptors and other bird species would include loss of habitat and foraging areas associated with the Southern Corridor ROW and possible collisions with motor vehicles after the project is completed. Forty-seven bird species were identified in the project area (see Appendix B, Bird Species).

4.12.3.3 3400 West Alternative

Potential direct impacts to wildlife for this alternative would be similar to those for the 4300 West Alternative, except that more habitat would be disturbed because of the longer corridor (see Figure 4-6, Potential Displacements).

4.12.3.4 2800 West Alternative

Potential direct impacts to wildlife for this alternative would be similar to those for the 4300 West Alternative, except that more habitat would be disturbed because of the longer corridor (see Figure 4-6, Potential Displacements) and there are potential impacts to golden eagles.

Golden Eagle. Although the golden eagle is not a federally listed species, it is protected by the Migratory Bird Act, Eagle Protection Act (U.S. Fish and Wildlife Service 1999). An active golden eagle nest was located south of this alternative on a large rock outcrop overlooking the proposed alignment in the Sand Mountain area. The eagle uses the area from February to June and could be disturbed by construction activities.

4.12.3.5 Mitigation Measures

Areas disturbed by construction within the highway ROW would be revegetated after construction with native plant species.

Golden Eagle. For the 2800 West Alternative, preconstruction surveys for golden eagles would be conducted in the project area where the active nest was noted. Nest monitoring would be conducted from January 1 to August 31 for any activities occurring within 0.5 mile of the nest. If golden eagles are disturbed in any manner, construction activities would stop and UDOT would immediately consult with USFWS and UDNR's Division of Wildlife Resources before resuming. Project employees would be informed of the presence of nesting golden eagles and cautioned to minimize disturbance.

4.12.4 Indirect Impacts on Wildlife

4.12.4.1 No-Build Alternative

As discussed above, the No-Build Alternative would require the development of new roadway pavement. However, the total amount of roadway pavement would be less. The indirect impacts from roadways would be similar to those under the build alternatives except that fewer overall acres would be affected.

Based on discussions with local city planning officials, the type and amount of development are expected to be similar under the No-Build and build alternatives, although the area in the southern part of the study area could grow at a faster rate under the build alternatives. The potential indirect impacts associated with this growth are analyzed below.

4.12.4.2 4300 West Alternative

The potential indirect impacts to wildlife under the 4300 West Alternative are habitat fragmentation, barriers to movement, disturbance from increased traffic and noise, and mortality from roadkills. The effects of barriers are expected to be more pronounced on ground-dwelling species than on birds and plants (Findlay and Houlahan 1997). These impacts would be permanent.

Fragmentation and Barriers to Movement. Habitat fragmentation and barriers to movement would occur throughout the length of the highway. Studies have shown that roads are a barrier to wildlife movement. Mader (1998) explains the causes of this barrier effect.

- Microclimatic conditions “break” at the edge of the road, an effect that gradually decreases with distance from the road.
- Vehicles generate a broad band of emissions and disturbances such as noise, dust, exhaust fumes, and increased salinity in the soil and vegetation.
- Road edges are zones of environmental instability (caused by vegetation trimming and spraying), and the composition of plants on the road edge varies from those in more distant habitats.
- Wildlife is in danger of being run over and killed.

Studies have also shown that terrestrial animals move parallel to a roadway much more often than they cross a roadway (Kozel and Fleharty 1979; Mader 1984; Mader and others 1990). However, the tendency of animals to cross a roadway can depend on other factors, such as the degree of similarity of habitats within and adjacent to the ROW, local population densities, resource availability, and

various other physical parameters of the potential barrier (Wilkins 1982). There are no known migration corridors through the project area, and the habitat value for large mammals is low. Therefore, only minor impacts would be expected because of fragmentation and barriers caused by the project.

Traffic and Noise. Table 4.12-2 outlines the disturbance distances given by seven scientific studies that analyzed the relationship between roadways and development and wildlife disturbance. As shown below, the disturbance distance shows a large amount of variance depending on whether researchers analyzed a specific species (for example, the lapwing) or a group of species (for example, reptiles and amphibians).

Table 4.12-2. Wildlife Disturbance Distances

Species or Group	Disturbance Distance ^a (feet)	Source of Disturbance	Percent Density Loss (if applicable)
Lapwing	656 to 6,562 ^b	Busy roadway (50,000 cars per day)	56% for maximum disturbance distance
	3,281 ^b	Farms and ribbon development	NA
Black-tailed godwit	656 to 6,562 ^b	Busy roadway (50,000 cars per day)	56% for maximum disturbance distance
	3,281 ^b	Farms and ribbon development	NA
	3,710 ^c	Busy roadway (50,000 cars per day)	48% for maximum disturbance distance
Reptiles and Amphibians	6,562 ^d	High paved road density	NA
Mammals	6,562 ^d	High paved road density	NA
Birds	1,640 ^d	High paved road density	NA
	246 to 11,580 ^e	Busy roadway (50,000 cars per day)	10 to 74%, based on distance of 0 to 4,920 feet (0 to 1,500 meters) from roadway
	230 to 9,186 ^f	Busy roadway (60,000 cars per day)	69% for maximum disturbance distance
	1,640 ^g	Busy roadway (45,000 cars per day)	15% for all species combined

^a Disturbance is defined as the "emission of stimuli to which animals may respond by avoiding the vicinity of the road" (Van der Zande and others 1980).

^b Source: Veen 1973; Van der Zande and others 1980

^c Source: Canters and Cuperus 1995

^d Source: Findlay and Houlahan 1997

^e Source: Reijnen and others 1996

^f Source: Reijnen and others 1995

^g Source: Reijnen and Thissen 1986

Typically, when all species are combined, the disturbance distance decreases. This is especially the case in the study by Reijnen and others (1996). They found that when the disturbance distance for a range of bird species was combined

statistically, the disturbance distance decreased from a range of 250 to 11,600 feet to a distance of 1,840 feet.

Other studies (Clark and Karr 1979; Ferris 1979; Adams and Geis 1983) show that certain species increase in density near roadways, possibly due to different conditions of vegetation structure close to the road that are more favorable to those species (for example, red-winged blackbird). However, this finding should be evaluated against indications that ROW corridors can also facilitate the movement of diseases, predators, exotic wildlife species, noxious weeds, and fire (Harris 1988; Mann and Plummer 1995).

Roadside habitats can also act as population sinks if mortality exceeds production. Continued mortality of immigrant wildlife next to the road edge could have a negative effect on the potential for population growth and stability of the species (Mumme and others 2000).

Density of Species. All of the studies presented above in Table 4.12-2 established disturbance distances by observing reductions in density of the species or group of species out to the maximum distance within the particular study area. Common factors believed to contribute to the reduction in density near roadways include collisions with vehicles, air pollution, visual stimuli, and noise load. Reijnen and Foppen (1994) and Reijnen and others (1995) determined that, although the other factors do account for some impacts on populations (mostly collisions with vehicles and visual stimuli), noise load is apparently the predominant disturbance source with the highest reduction in density.

It appears from these studies that species sensitive to roadway noises avoid roadway areas, which might reduce the quality of habitat and therefore reduce population size, breeding densities, and species richness. This avoidance could be due to hearing loss, increase in stress hormones, altered behaviors, interference with communication during breeding activities, differential sensitivity to different frequencies, and harmful effects on food supply or other habitat attributes (Forman and Alexander 1998).

The effect of roads on density of species varies with species, highway type, season, and distance from the highway (Clark and Karr 1979). There are also arguments that population might alter a species' distribution, without a reduction in population, to areas farther from the road, resulting in an increase in density at a greater distance (Van der Zande and others 1980).

Roadkills. Many factors contribute to the rates of wildlife mortality from roadkills: speed limit, traffic volume, roadside vegetation, presence or absence of roadway curves, and type of adjacent habitat (Florida Department of Transportation 1996). Amphibians and reptiles tend to be particularly susceptible

on two-lane roads with low to moderate traffic. Large and mid-sized mammals are susceptible on two-lane, high-speed roads, and birds and small mammals are susceptible on wider, high-speed highways (Forman and Alexander 1998). Because of the nature of habitat quality and the low density of any one species, no adverse impacts to the population size of any one species are expected in the project area.

Future Development. Another issue is impacts on the quality of wildlife habitat due to expected future development with or without the Southern Corridor. Based on discussions with local planning officials, it is expected that the amount and type of area developed under the 4300 West Alternative would be similar to those under the No-Build Alternative. The indirect impacts mentioned for the Southern Corridor would be small in comparison to the expected growth and resulting development that will occur by 2030. This development would extend throughout the project area, causing more impacts on wildlife habitat. This predicted development would have many of the same indirect impacts, such as habitat fragmentation, disturbance from noise and traffic, and mortality from roadkills. These impacts are further addressed in Section 4.12.5, Cumulative Impacts.

4.12.4.3 3400 West Alternative

Indirect impacts to wildlife under this alternative would be similar to those for the 4300 West Alternative, except that more habitat would be disturbed because of the larger corridor.

4.12.4.4 2800 West Alternative

Indirect impacts to wildlife under this alternative would be similar to those for the 4300 West Alternative, except that the most habitat would be disturbed.

4.12.5 Cumulative Impacts

Growth in Washington County is likely to occur with or without the Southern Corridor, and interactions between the transportation alternatives and anticipated urban growth would likely cause long-term cumulative impacts. The geographic scope of this analysis is generally Washington County, and the timeframe for the analysis is from the 1970s to 2030.

Other projects in the region, such as the St. George replacement airport, Sand Hollow Reservoir, the new interchange on I-15 at RP 13, and new developments to accommodate growth, are reducing the amount of available wildlife habitat. Washington County is about 1,556,000 acres, of which 27,700 acres have been developed and 1,219,000 acres are undevelopable or constrained. These con-

strained lands include BLM, Forest Service, National Park Service, Indian reservation, and physically constrained lands such as floodplains and steep slopes.

The continued trend toward development within the city boundaries has resulted in loss of habitat at a fast rate. This reduction has resulted in several species being listed by the State of Utah and USFWS as threatened or endangered (see Section 4.14, Threatened and Endangered Species Impacts). However, large land areas in Washington County associated with BLM, Forest Service, and National Park Service would remain relatively undisturbed habitat.

Within the county, about 225,300 acres or 15% of the land area is available for development, which would result in the loss of wildlife habitat. The habitat in this area consists of desert scrub and salt bush, some of which has been disturbed by recreation activities and grazing. Construction of the Southern Corridor would contribute less than 1% to the loss of total habitat, and therefore would not be the major contributor to cumulative impacts. However, the total loss of habitat from development would cause additional habitat fragmentation, loss of migration corridors, and direct mortality to wildlife.

Potential cumulative impacts from past development and future growth are addressed in the *Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement* (BLM 1998). This plan covers most of Washington County and includes 629,000 acres, or 40% of the total land in the county. The past growth has resulted in habitat loss and fragmentation as well as interruptions to wildlife corridors and migration routes, and would continue to adversely affect wildlife in and near expanding communities.

The National Park Service, Forest Service, and BLM have developed strategies for protecting and maintaining wildlife habitat on federal lands. Even with the expected population growth, BLM believes that healthy, sustainable, and diverse wildlife populations can continue to exist in the BLM St. George Field Office district area. BLM would continue to work with affected interests to ensure that important wildlife habitat areas are maintained (BLM 1998).

4.12.5.1 Recommendations for Minimizing Cumulative Impacts

To minimize loss of wildlife habitat, the cities should implement land use planning that reduces the amount of area required for development. For example, compact development has clear effects on the environment by reducing disruption and fragmentation of habitat, which allows for wildlife corridors such as stream beds or green belts. The large tracts of continuous land provided by compact developments allow preservation of more natural wildlife habitats and open space, including farmland and natural areas. Maintaining open space and

natural areas contributes to the economic, recreational, and ecological value of a community. See Chapter 6, Smart Growth, for more details.

In addition, the cities, SITLA, and BLM should work together to address habitat concerns in the project area to ensure that the most important wildlife habitat is preserved.

4.13 Floodplain Impacts

Floodplains provide important and critical habitat for many wildlife species. Floodplains are an important part of the watershed, have a major role in maintaining and improving water quality, and are the location of most wetlands and riparian areas in Washington County. A properly functioning floodplain has a major role in protecting adjacent areas from damage during flood events (WCWCD 1999). Most of the floodplains in the project area have not been mapped. For analysis purposes, those areas next to the Virgin River and major washes were considered floodplains. The Atkinville Wash floodplain along the Southern Corridor alignment was mapped for this project.

4.13.1 Floodplain Management

Federal Policy. Executive Order 11988, Floodplain Management (May 24, 1977), established federal policy “to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.”

Required Permits. A Floodplain Development Permit must be obtained before any work in a floodplain area. For this project, the local participating agency that grants this permit is the City of St. George. A listing of the agencies for the Floodplain Development Permit is included in Section 4.22, Permits and Clearances.

4.13.2 Impacts to Floodplains

4.13.2.1 No-Build Alternative

Under the No-Build Alternative, some local arterial roads would cross the floodplains of the Fort Pearce and Atkinville Washes and other minor drainages. The Fort Pearce Wash would be crossed by a proposed road to the St. George replacement airport that could enter into the floodplain. None of the proposed arterials should affect the Virgin River floodplain. Overall, no direct or indirect impacts to floodplains are expected because any development in a floodplain

would require a Floodplain Development Permit that includes floodplain management.

4.13.2.2 4300 West Alternative

The Southern Corridor has some longitudinal encroachment of the Atkinville Wash and a transverse encroachment of the Fort Pearce Wash. Encroachment into the Virgin River Floodplain would be avoided.

Encroachment. To obtain the Floodplain Development Permit, supporting documentation is required to show that the proposed action would not significantly change the 100-year floodplain or significantly increase flooding. What constitutes “significantly” is determined on a case-by-case basis, considering adjacent development. A 1-foot increase in the 100-year flood elevation is set as the upper limit by FEMA.

FHWA regulations require a finding that the proposed significant encroachment is the only practicable alternative (23 CFR 650.113). A significant encroachment can arise from any of the following situations:

- Significant potential for interrupting or terminating a transportation facility that is needed for emergency vehicles, or that provides a community’s only evacuation route
- A significant risk of upstream flooding
- A significant adverse impact on natural and beneficial floodplain values

None of these factors would be present for the 4300 West Alternative.

Surface Water Flows. The Southern Corridor has some lateral encroachment into the 100-year floodplain of the Atkinville Wash. However, this encroachment does not affect the 100-year floodway and would not restrict the flood-carrying capacity of the Atkinville Wash. The Southern Corridor would cross the Fort Pearce Wash in a way that allows proper drainage and capacity for a 100-year flood.

Traffic Interruptions. The probability of a flood event that could interrupt traffic or close the highway is very low (less than 1%). Should such an event occur, surface streets would be available for emergency vehicles and evacuation needs.

Flooding Risk. The Southern Corridor would be designed to accommodate the 100-year flood flows and would not increase the flood elevation of the major drainages in the area. Therefore, none of the build alternatives would increase the flooding risk.

Natural Features. The Southern Corridor would have a minor impact on the vegetation and habitat of the Fort Pearce and Atkinville Washes. No other natural floodplain values would be impacted.

No Significant Encroachment. For the reasons stated above, the encroachment of the Southern Corridor on area floodplains would not be significant.

4.13.2.3 3400 West Alternative

All three build alternatives are similar in the southern part of the study area where the floodplains are located. Therefore, floodplain impacts for this alternative would be similar to those for the 4300 West Alternative.

4.13.2.4 2800 West Alternative

All three build alternatives are similar in the southern part of the study area where the floodplains are located. Therefore, floodplain impacts for this alternative would be similar to those for the 4300 West Alternative.

4.14 Threatened and Endangered Species Impacts

Special status species include plant and animal species that are currently listed as threatened or endangered by USFWS. Special status species also include State of Utah sensitive species as designated by UDNR's Division of Wildlife Resources. Special status species that are potentially affected or likely to be affected by the proposed project are listed in Table 4.14-1. Potential cumulative impacts to threatened and endangered species are addressed in Section 4.14.3, Cumulative Impacts. Information for this section was taken from the biological assessment prepared for the Southern Corridor (Intermountain Ecosystems 2002). Species trend information was obtained from the *Inventory of Sensitive Species and Ecosystems in Utah, Inventory of Sensitive Vertebrate and Invertebrate Species: A Progress Report* (UDWR 1997). No trend data on plant species were available.

Table 4.14-1. Special Status Species Potentially Affected by the Southern Corridor

Species		Habitat	Status		Location/ Likelihood of Adverse Effects
Common Name	Scientific Name		Federal	State	
Plants					
Bearclaw poppy	<i>Arctomecon humilis</i>	Gypsum outcrops of Moenkopi Formation	E	—	White Dome along all alternatives. Adverse effects likely.
Shivwits milkvetch	<i>Astragalus ampullariodes</i>	Desert grassland	E	—	Not found along alternatives. No adverse effects.
Holmgren milkvetch	<i>Astragalus holmgreniorum</i>	Virgin River limestone member of Moenkopi Formation	E	—	Atkinville Wash along all alternatives. Adverse effects likely.
Siler cactus	<i>Pediocactus sileri</i>	Shnabkaib and Middle Red members of Moenkopi Formation	E	—	Warner Ridge and White Dome along all alternatives. Adverse effects possible from cumulative impacts.
Birds					
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Virgin River at Harrisburg Dome area	E	E	Potential along Virgin River. No adverse affects.
Burrowing owl	<i>Athene cunicularia</i>	Grassland, desert scrub foraging	—	SP	Historic occurrence. No adverse effects.
Bald eagle	<i>Haliaeetus leucocephalus</i>	Winter roost site at junction of SR 9 and 4300 West Alternative	T	T	In project area along 4300 West Alternative. Not likely to affect.
Yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	Riparian habitats	C	T	Low potential along Virgin River. No adverse effects.
Peregrine falcon	<i>Falco peregrinus anatum</i>	Zion National Park	—	E	Low potential along all alternatives. No adverse effects.
Ferruginous hawk	<i>Buteo regalis</i>	Pinyon-juniper woodland/grassland	—	T	Low potential along all alternatives. No adverse effects.
Swainson's hawk	<i>Buteo swainsoni</i>	Desert grasslands	—	SP	Low potential along all alternatives. No adverse effects.
Bell's vireo	<i>Vireo bellii</i>	Riparian habitats	—	SP/SD	Low potential along Virgin River. No adverse effects.
Blue grosbeak	<i>Guiraca caerulea</i>	Riparian habitats	—	SP	Low potential along Virgin River. No adverse effects.
Common yellowthroat	<i>Geothlypis trichas</i>	Riparian habitats	—	SP	Low potential along Virgin River. No adverse effects.

Species		Habitat	Status		Location/ Likelihood of Adverse Effects
Common Name	Scientific Name		Federal	State	
Crissal thrasher	<i>Toxostoma crissale</i>	Mesquite/warm desert scrub	—	SP/SD	Low potential along all alternatives. No adverse effects.
Reptiles/Amphibians/Fish					
Desert tortoise	<i>Gopherus agassizii</i>	Washes, rock outcrops in warm desert scrub	T	E	Historic occurrence. No adverse effects.
Gila monster	<i>Heloderma suspectum</i>	Sandy areas in warm desert scrub	—	E	High potential occurrence along all alternatives. Likely short-term effects. No long-term effects likely.
Virgin River chub	<i>Gila seminuda</i>	Virgin River	E	E	In Virgin River. Not likely to affect
Woundfin	<i>Plagopterus argentissimus</i>	Virgin River	E	E	In Virgin River. Not likely to affect.
Virgin spinedace	<i>Lepidomeda mollispinis mollispinis</i>	Virgin River	—	CS	In Virgin River. No adverse effects.
Speckled dace	<i>Rhinichthys osculus</i>	Virgin River	—	SP	In Virgin River. No adverse effects.
Desert sucker	<i>Catostomus clarki</i>	Virgin River	—	SP	In Virgin River. No adverse effects.
Flannelmouth sucker	<i>Catostomus latipinnis</i>	Virgin River	—	SP	In Virgin River. No adverse effects.
Western chuckwalla	<i>Sauromalus obesus</i>	Rock outcrops in warm desert scrub	—	SP/SD	High potential occurrence along all alternatives. Likely short-term effects. No long-term effects likely.
Southwestern toad	<i>Bufo microscaphus</i>	Desert riparian zones	—	SP	Along all alternatives. No adverse effects.
Utah banded gecko	<i>Coleonyx variegatus</i>	Rocky terrain in warm desert scrub	—	SD	High potential for occurrence. No long-term adverse effects likely.
Desert iguana	<i>Dipsosaurus dorsalis</i>	Sandy and rocky areas in warm desert scrub	—	SD	Low potential for occurrence. No adverse effects.
Mojave zebra-tailed lizard	<i>Callisaurus draconoides rhodicticus</i>	Sandy washes and gypsum areas in warm desert scrub	—	SD	Frequent along all alternatives. Likely short-term effects. No long-term effects.
California king snake	<i>Lampropeltis getulus californiae</i>	Rocky wooded slope and riparian areas	—	SD	Low potential for occurrence. Adverse effects not likely.

Species		Habitat	Status		Location/ Likelihood of Adverse Effects
Common Name	Scientific Name		Federal	State	
Southwestern black-headed snake	<i>Tantilla hobartsmithi</i>	Wooded and riparian areas	—	SD	Low potential for occurrence. Adverse effects not likely.
Sonoran lyre snake	<i>Trimorphodon biscutatus lambda</i>	Grasslands and warm desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Desert glossy snake	<i>Arizona elegans eburnata</i>	Creosote-mesquite habitats	—	SD	Low potential for occurrence. Adverse effects not likely.
Mojave desert sidewinder	<i>Crotalus cerastes</i>	Sandy areas in warm desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Mojave patch-nosed snake	<i>Salvadora hexalepis mojavensis</i>	Desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Desert night lizard	<i>Xantusia vigilis vigilis</i>	Rock outcrops among debris in warm desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Utah blind snake	<i>Leptotyphlops humilis utahensis</i>	Variety of habitats in warm desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Mammals					
Big free-tailed bat	<i>Nyctinomops macrotis</i>	Variety of habitats in warm desert scrub	—	SP/SD	Low potential for occurrence. Adverse effects not likely.
Brazilian free-tailed bat	<i>Tadarida brasiliensis mexicana</i>	Variety of habitats in warm desert scrub	—	SP/SD	Low potential for occurrence. Adverse effects not likely.
Townsend's big-eared bat	<i>Plecotus townsendii</i>	Variety of habitats in warm desert scrub	—	SP/SD	Low potential for occurrence. Adverse effects not likely.
Western red bat	<i>Lasiurus blossevillii</i>	Variety of habitats in warm desert scrub	—	SP/SD	Low potential for occurrence. Adverse effects not likely.
Allen's big-eared bat	<i>Idionycteris phyllotis</i>	Variety of habitats in warm desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Fringed myotis	<i>Myotis thysandoes</i>	Variety of habitats in warm desert scrub	—	SD	Low potential for occurrence. Adverse effects not likely.
Spotted bat	<i>Euderma maculatum</i>	Variety of habitats in warm desert scrub	—	SP	Low potential for occurrence. Adverse effects not likely.
Ringtail	<i>Bassariscus astutus</i>	Variety of habitats in warm desert scrub	—	SD	Infrequent along the Virgin River. Likely short-term effects. No long-term effects.

Species		Habitat	Status		Location/ Likelihood of Adverse Effects
Common Name	Scientific Name		Federal	State	
Desert kangaroo rat	<i>Dipodomys desertii</i>	Warm desert scrub	—	SP/SD	Moderate potential for occurrence. Adverse effects not likely.
Southern grasshopper mouse	<i>Onychomys torridus</i>	Desert scrub	—	SD	Frequent along all alternatives. Likely short-term effects. No long-term effects.
Cactus mouse	<i>Peromyscus eremicus</i>	Mesic shaded canyons	—	SD	Infrequent along all alternatives. Likely short-term effects. No long-term effects.

E = Endangered, T = Threatened, SP = State declining populations, SD = State limited distribution, CS = Conservation species, SP/SD = State declining population and limited distribution

Because BLM manages the most land in Washington County (40% or 629,000 acres), their management of threatened and endangered species plays an important role in the continued existence of these species. Under both the No-Build and build alternatives, BLM will continue to help recover listed species. Where threatened and endangered species occur on public lands in Washington County, BLM will work with affected local, state, and federal agencies and researchers to implement approved recovery plans. In addition, BLM will develop public education programs on species at risk.

Generally, public lands containing sensitive species will be kept in public ownership unless an exchange or transfer would acquire better habitat. BLM will also eliminate one or more uses where studies and related data support the conclusion that no other alternatives will resolve the conflicts (BLM 1998). Overall, 76% of the land in Washington County is managed by the federal government (BLM, Forest Service, and National Park Service); these areas provide more protection for threatened and endangered species than private and state land.

USFWS Biological Opinion. USFWS provided a biological opinion for the Southern Corridor EIS to FHWA on September 20, 2002 (see Appendix C, Pertinent Correspondence). USFWS concurred with the following determinations:

- **Likely to adversely affect:** Holmgren milkvetch, bearclaw poppy, Siler cactus
- **No effect:** Desert tortoise, Mexican spotted owl, southwestern willow flycatcher, Shivwits milkvetch
- **May affect, not likely to affect:** Bald eagle, Virgin River chub, woundfin

The USFWS biological opinion stated that the proposed project is not likely to jeopardize the continued existence of the Holmgren milkvetch, bearclaw poppy, or Siler cactus provided that the active conservation (mitigation) measures outlined below and in the biological opinion are taken. In addition, the conservation measures identified in this EIS will minimize any adverse effects of the proposed Southern Corridor on the bald eagle, Virgin River chub, and woundfin. The project will not affect the desert tortoise, Mexican spotted owl, southwestern willow flycatcher, or Shivwits milkvetch.

4.14.1 Plants

4.14.1.1 No-Build Alternative

Under the No-Build Alternative, local arterial roads that would be developed could affect threatened and endangered species. A review of the potential arterial roads and their potential impacts follows.

- The access road from I-15 to the St. George replacement airport would go through habitat for bearclaw poppy, Holmgren milkvetch, and Siler cactus. Because the road has not yet been designed, the actual acreage of impacts cannot be estimated. Potential impacts to these species would be similar to or slightly less than those for the build alternatives.

Although no threatened and endangered species habitat was found in other projects in the study area, such as the St. George replacement airport and the Sand Hollow Reservoir, the planned developments on state and private land could affect some species. See Section 4.14.3, Cumulative Impacts, for a detailed discussion of impacts from development.

4.14.1.2 4300 West Alternative

Bearclaw Poppy. Bearclaw poppy is likely to be adversely affected by the Southern Corridor. Approximately one poppy and 6.2 acres of habitat would be within the ROW at White Dome. Some of these acres would be affected by construction activities, and some would be preserved by fencing off the ROW so that no construction would take place. During initial development of the Southern Corridor, the alignment was shifted southward toward the Arizona border to avoid as much habitat at White Dome as possible. In addition, the alignment was shifted west near Warner Ridge to avoid habitat. One benefit of the Southern Corridor for this species is that the highway would allow BLM to better manage OHV access along Warner Ridge, which should minimize long-term impacts.

The Southern Corridor's fragmentation of the Warner Ridge and White Dome bearclaw poppy populations could have some negative indirect impacts on the

bees that are potential pollinators of the poppy. *Perdita meconis* and *Synhalonia quadricincta* are rare ground-nesting bees and are pollinator-specific to poppies. Ground-nesting bees could be affected during construction, thus reducing the numbers of potential pollinators. After construction, traffic could kill bees in flight between poppy populations on Warner Ridge and White Dome. A reduction in pollinators could reduce gene flow between and within the Warner Ridge and White Dome populations and consequently could affect the reproductive success of the poppy.

Holmgren Milkvetch. Holmgren milkvetch is likely to be adversely affected by the Southern Corridor. About six to eight plants and 2.3 acres would be within the ROW at Atkinville Wash. During initial development of the Southern Corridor alignments, about 11 acres of milkvetch habitat were avoided by relocating the ROW 100 feet south of the existing plants.

Holmgren milkvetch is pollinated by three species of large anthophorid bees in the genus *Halics* (*Anthophora*), all of which nest in the ground. Although milkvetch is self-compatible and not totally dependent on animal pollinators, highway construction and use could cause direct and indirect impacts to ground-nesting bees. The effects of this action are unclear for milkvetch, but it is clear that the number of potential pollinators would be reduced.

Siler Cactus. Siler cactus was not located along the Southern Corridor alignments, but it occurs just north of the ROW at White Dome. No direct impacts to this species are anticipated. Overall indirect impacts to threatened and endangered species would be similar to those described under the No-Build Alternative.

Shivwits Milkvetch. Shivwits milkvetch was not located along the Southern Corridor alignment during the field survey; therefore, no impacts would occur.

4.14.1.3 3400 West Alternative

Potential impacts to threatened and endangered plants for this alternative would be the same as those for the 4300 West Alternative.

4.14.1.4 2800 West Alternative

Potential impacts to threatened and endangered plants for this alternative would be the same as those for the 4300 West Alternative.

4.14.1.5 Mitigation Measures

The detailed mitigation measures for the following species are identified in the USFWS biological opinion in Appendix C. These measures are summarized

below. The conservation measures listed in the biological opinion might be modified as a consequence of ongoing discussions with SITLA.

All occupied endangered and threatened plant habitat within the ROW would be considered to be impacted and in need of replacement. The occupied habitat area of the below plant species would be defined as an area with a radius of 50 meters (164 feet) centered on each plant or plant cluster.

Bearclaw Poppy. Mitigation for the bearclaw poppy would consist of one-for-one conservation of habitat acreage impacted. Conservation would consist of purchasing and protecting in-kind habitat next to the Southern Corridor on the north side of the highway. Bearclaw poppy grows abundantly at White Dome, which is owned by the State of Utah. Fencing White Dome has already been proposed in the Washington County Habitat Conservation Plan and is the recommended mitigation for maintaining poppy habitat.

Poppy populations at Warner Ridge are protected somewhat by being in a BLM-administered area of critical environmental concern. In addition, the Warner Ridge population could be protected by the Southern Corridor by limiting interchanges and reducing OHV access between the Redhawk subdivision and Washington Dam Road.

The highway footprint would be minimized within the ROW at both White Dome and Warner Ridge to limit direct construction impacts. Disturbing natural vegetation in the ROW would also be limited to maintain the composition of native plant species and to protect ground-nesting pollinators. Disturbed ROW would be revegetated with native shrubs and grasses. In addition, road signs would be posted in habitat areas to notify UDOT maintenance crews to contact the regional environmental coordinator before performing any activities.

Because the bearclaw poppy could establish itself in the Southern Corridor ROW before the proposed construction period (2006–2008), preconstruction surveys would be required to verify poppy occurrence.

Holmgren Milkvetch. Mitigation for Holmgren milkvetch would consist of one-for-one conservation of habitat acreage impacted. Conservation would consist of purchasing and protecting in-kind habitat next to the Southern Corridor. A maximum 300-foot fenced ROW would be used to protect habitat directly adjacent to the highway, and the highway footprint would be minimized. Because milkvetch could establish itself in the Southern Corridor ROW before the proposed construction period (2006–2008), preconstruction surveys would be required to verify milkvetch occurrence.

For successful maintenance of milkvetch within the ROW, construction and maintenance activities should disturb the site as little as possible. Holmgren

milkvetch is particularly sensitive to invasive annuals, and an integrated weed-management program would be designed and implemented during and after construction. Disturbing natural vegetation in the ROW would also be restricted to maintain ground-nesting pollinators and the composition of native plant species. Disturbed ROW would be revegetated with native shrubs and grasses. In addition, road signs would be posted in habitat areas to notify UDOT maintenance crews to contact the regional environmental coordinator before performing any activities.

Siler Cactus. Mitigation would consist of one-for-one conservation of habitat acreage impacted. Conservation would consist of purchasing and protecting in-kind habitat next to the Southern Corridor. Other mitigation would be the same as described for the above plant species. Because Siler cactus could establish itself in the Southern Corridor ROW before the proposed construction period (2006–2008), preconstruction surveys would be required to verify cactus occurrence.

4.14.2 Wildlife

4.14.2.1 No-Build Alternative

Under the No-Build Alternative, local arterial roads that would be developed could affect threatened and endangered species. A review of the potential arterial roads and their potential impacts follows.

- Construction of a 4300 West arterial in Hurricane could disturb a bald eagle's winter roost site.
- Improvements to existing roads over or near the Virgin River (River Road and 2450 East) could affect southwestern willow flycatcher habitat and sensitive fish species that use the river.

Although no threatened and endangered species habitat was found in other projects in the study area, such as the St. George replacement airport and the Sand Hollow Reservoir, the planned developments on state and private land could affect some species. See Section 4.14.3, Cumulative Impacts, for a detailed discussion of wildlife impacts from development.

4.14.2.2 4300 West Alternative

Birds

Southwestern Willow Flycatcher. The field inventory found no suitable habitat for the southwestern willow flycatcher at either the Fort Pearce or Atkinville Washes. In 1998, southwestern willow flycatchers were located just southeast of St. George. Known breeding pairs occur about 3 miles west of the project area at

Seegmiller Marsh and at the duck pond at Cottam Bench. The ROW is planned to come within 0.5 mile of the banks of the Virgin River at Washington Canal and Harrisburg Dome. Surveys in 1998 indicated that no southwestern willow flycatchers were present in the Washington Canal or Harrisburg Dome areas. Construction of the Southern Corridor could occur over an extended period. During this time, this species could establish itself in the Washington Canal and Harrisburg Dome areas along the Virgin River. Additional surveys would be conducted before construction to determine species occurrence.

Bald Eagle. The bald eagle is currently fairly common and widespread in winter, but reduced from former times as a breeder in Utah. BLM indicated a winter roost site at the junction of SR 9 and 4300 West. Construction activities could potentially affect the use of this site during the roost period, November 1 through March 1. UDOT would limit construction activities according to the mitigation listed in Table 4.23-1, Mitigation Summary. However, the project would not adversely affect this species.

Yellow-Billed Cuckoo. The yellow-billed cuckoo is less common today and is threatened by loss of riparian habitat. The yellow-billed cuckoo is a federal candidate species and a state threatened species. It nests in localized riparian habitats throughout Utah but has a low potential of occurring along any alternative, and therefore is not likely to be adversely affected.

Peregrine Falcon. The peregrine falcon might be increasing since its historical decline in Utah. The peregrine falcon is a state endangered species and is found outside the study area in Zion National Park. The peregrine does not nest in any of the alternatives, but could occur as a visitor. It is not likely to be adversely affected.

Ferruginous Hawk. The ferruginous hawk is widespread in Utah and is a fairly common breeding species, known to have declined in recent years in at least the northern part of the state. The ferruginous hawk is a state threatened species and is found outside the study area in pinyon-juniper woodland/grassland transition zones. This species does not nest in any of the alternatives; therefore, it is not likely to be adversely affected.

Swainson's Hawk. Numbers of Swainson's hawk have declined recently and it is less common now than in previous years. Swainson's hawk is a state species of special concern and nests in open desert grasslands. This species was observed outside the study area as a fall migrant and is not likely to be adversely affected.

Burrowing Owl. The burrowing owl has been mostly driven from the more populated areas. The burrowing owl is a state species of special concern. It is a neotropical migrant and nests in desert valleys and grasslands. An abandoned

nest was found in the project area near Punchbowl Dome. Several historic sites have been discovered since the 1999 inventory near Leucadia and Sand Hollow. Because no burrowing owls were found during the survey, no adverse effects are expected.

Bell's Vireo. The population trend of the Bell's vireo in Utah is unknown. It is listed as a state species of special concern and nests in willows on the Virgin River. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Blue Grosbeak. Population trends in Utah are not available for the blue grosbeak. Blue grosbeak is a state species of special concern and occurs along the Virgin River. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Common Yellowthroat. The population trend of the common yellowthroat in Utah is unknown, but is presumed to be declining. The common yellowthroat is a state species of special concern and nests along the Virgin River. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Crissal Thrasher. The population trend of the crissal thrasher in Utah is unknown, but is presumed to be stable. Crissal thrasher is a state species of special concern and nests in dense mesquite along the Virgin River. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Fish

Virgin River Chub. The Virgin River chub population is declining in Utah. Field inventories were not conducted for the Virgin River chub because the Virgin River itself would not be disturbed during construction. The proposed ROW is projected to be at least 700 feet from the Virgin River at its nearest point. Soil disturbance, destruction of vegetation, and siltation during construction could increase runoff into the river; however, with the implementation of BMPs noted in Section 4.14.2.5, Mitigation Measures, no adverse impacts are expected. No water quality impacts to the Virgin River are expected during operation of the Southern Corridor (see Section 4.10, Water Quality Impacts).

Woundfin. The woundfin population is declining in Utah. Field inventories were not conducted for woundfin because the Virgin River itself would not be disturbed during construction. Possible impacts to the woundfin would be similar to those for the Virgin River chub.

Virgin Spinedace. The original distribution of the Virgin spinedace is relatively intact, but populations have been reduced or exterminated in developed areas. Field inventories were not conducted for the spinedace because the Virgin River itself would not be disturbed during construction. Possible impacts to the Virgin spinedace would be similar to those for the Virgin River chub.

Speckled Dace. The population trend of the speckled dace is unavailable. Field inventories were not conducted for the speckled dace because the Virgin River itself would not be disturbed during construction. Possible impacts to the speckled dace would be similar to those for the Virgin River chub.

Desert Sucker. The population trend for the desert sucker in Utah is unknown, but is presumed to be stable. Field inventories were not conducted for desert sucker because the Virgin River itself would not be disturbed during construction. Possible impacts to the desert sucker would be similar to those for the Virgin River chub.

Flannelmouth Sucker. The population trend for the flannelmouth sucker in Utah is not certain, but it might be declining. Field inventories were not conducted for flannelmouth sucker because the Virgin River itself would not be disturbed during construction. Possible impacts to the flannelmouth sucker would be similar to those for the Virgin River chub.

Reptiles

Desert Tortoise. The desert tortoise population has declined over the past few decades and is experiencing high mortality. The desert tortoise is a federally threatened and state endangered species and is found in the Red Cliffs Desert Reserve as part of the Washington County Habitat Conservation Plan. It occupies desert washes, dunes, and rocky slopes in creosote and Joshua tree communities. The 4300 West Alternative could theoretically support desert tortoises, but the field inventory indicated no recent occupation; therefore, no adverse affects are anticipated. However, if desert tortoises are found during construction, they would be relocated according to the conservation plan.

Gila Monster. The gila monster has experienced a decline in population of about 85% compared to its estimated historical population. Gila monsters were not found in the study area, but they have a high potential of occurring in a variety of habitats in the warm desert scrub community. Short-term, localized impacts are possible, but long-term adverse effects are not anticipated.

Western Chuckwalla. The population trend for the western chuckwalla in Utah is not known, but is probably stable. Western chuckwallas were not located in the study area, but they have a high potential of occurring in rock outcrops that are

vegetated with shrubs and forbs. Short-term, localized impacts are possible, but long-term adverse effects are not anticipated.

Southwestern Toad. The population trend for the southwestern toad in Utah is unknown. The southwestern toad is a state species of special concern. It was located in moist shaded canyons associated with Willow Springs, a small desert riparian zone that occurs in north Warner Valley. The 4300 West Alternative was moved to avoid the Willow Springs area; therefore, this species is not likely to be adversely affected.

Utah Banded Gecko. The Utah banded gecko population is probably stable. The Utah banded gecko is a state species of special concern and has a high potential of occurring in very dry habitats with rocky terrain, canyon walls, and sand dunes. Short-term, localized impacts are possible, but long-term adverse effects are not anticipated.

Desert Iguana. Historical dewatering of Beaver Dam Wash could have favored this species. The desert iguana is listed a state species of special concern and occurs in sandy and rocky areas in creosote bush. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Mojave Zebra-Tailed Lizard. The population trend for the Mojave zebra-tailed lizard in Utah is unknown. The species is a state species of special concern and was found at Washington Dome, Warner Ridge, and Atkinville Wash. Habitats varied from sandy washes to caliche and gypsum substrates. This species is likely to be affected, but long-term adverse impacts to local populations are not anticipated.

California King Snake. The population trend for California king snake in Utah is unknown, but is probably stable. The California king snake is a state species of special concern and inhabits rocky wooded slopes and riparian areas. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Southwestern Black-Headed Snake. The population trend for the southwestern black-headed snake in Utah is unknown. The southwestern black-headed snake is a state species of special concern and inhabits wooded canyon, arroyos, and riparian areas. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Sonoran Lyre Snake. The population trend for the Sonoran lyre snake in Utah is unknown. The species is a state species of special concern and inhabits rocky areas in grasslands and creosote. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Desert Glossy Snake. The population trend for the desert glossy snake in Utah is unknown. The species is a state species of special concern and inhabits creosote-mesquite. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Mojave Desert Sidewinder. The population trend for the Mojave desert sidewinder in Utah is unknown, but is believed to be stable. The Mojave desert sidewinder is a state species of special concern and inhabits sandy areas. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Mojave Patch-Nose Snake. The population trend for the Mojave patch-nose snake in Utah is unknown, but is probably stable. The Mojave patch-nose snake is a state species of special concern and inhabits desert scrub. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Desert Night Lizard. The population trend for the desert night lizard in Utah is unknown, but is probably stable. The desert night lizard is a state species of special concern and inhabits rock outcrops among fallen leaves and trunks of yuccas and agaves. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Utah Blind Snake. The population trend for the Utah blind snake in Utah is unknown, but is believed to be stable. The Utah blind snake is a state species of special concern and inhabits a variety of habitats suitable for burrowing. This species has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Mammals

Big Free-Tailed Bat. The population trend for the big free-tailed bat in Utah is unknown. This species is a state species of special concern and extends to the southern two-thirds of Utah. It has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Brazilian Free-Tailed Bat. The population trend for the Brazilian free-tailed bat in Utah is unknown. The Brazilian free-tailed bat is a state species of special concern and can be found in southern Utah, but was not located in any of the alternatives. Therefore, it is not likely to be adversely affected.

Townsend's Big-Eared Bat. The population trend for Townsend's big-eared bat in Utah is believed to be declining. Townsend's big-eared bat is a state species of special concern. It is statewide in distribution but was not located in any of the alternatives. Therefore, it is not likely to be adversely affected.

Western Red Bat. There are so few records for the western red bat in Utah that determining a population trend is difficult. The species is a state species of special concern and has been confirmed in Washington County. It has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Allen's Big-Eared Bat. The population trend for Allen's big-eared bat in Utah is unknown. Allen's big-eared bat is a state species of special concern and is not well known. It has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Fringed Myotis. The population trend for fringed myotis in Utah is unknown. However, since most species of bats are believed to be decreasing in numbers throughout the U.S., this species might be declining in Utah as well. The fringed myotis is a state species of special concern and is statewide in distribution. It has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Spotted Bat. The population trend for the spotted bat in Utah is unknown. The data are difficult to assess, although there are increasing reports of this species in Utah. The spotted bat is a state species of special concern and is declining throughout the West. It has a low potential of occurring in the alternatives; therefore, it is not likely to be adversely affected.

Ringtail. The population trend for ringtail in Utah is unknown. The ringtail is a state species of special concern (SD) and was located along the Virgin River just outside the study area. It is a highly mobile species and is not likely to be adversely affected.

Desert Kangaroo Rat. The desert kangaroo rat still inhabits southern portions of its original habitat. The desert kangaroo rat is a state species of special concern and is restricted to Washington County. It has a moderate potential of occurring in the alternatives but was not found during the field survey, so long-term adverse effects are not likely.

Southern Grasshopper Mouse. The population trend for southern grasshopper mouse in Utah is unknown, but is believed to be stable. The southern grasshopper mouse is a state species of special concern and was found throughout all alternatives in desert scrub vegetation. Some loss of individuals is likely because of habitat loss, but no long-term adverse effects are anticipated.

Cactus Mouse. The population trend for cactus mouse in Utah is unknown, but is believed to be stable. The cactus mouse is a state species of special concern and was found at three locations in mesic shaded canyons associated with rock

formations. Some individuals are likely to be affected because of habitat loss, but no long-term adverse effects are anticipated.

4.14.2.3 3400 West Alternative

Potential impacts to threatened and endangered wildlife for this alternative would be similar to those for the 4300 West Alternative, except that this alternative would not affect the bald eagle roost site.

4.14.2.4 2800 West Alternative

Potential impacts to threatened and endangered wildlife for this alternative would be similar to those for the 4300 West Alternative, except that this alternative would not affect the bald eagle roost site.

4.14.2.5 Mitigation Measures

The detailed mitigation measures for the following species are identified in the USFWS biological opinion in Appendix C, Pertinent Correspondence. These measures are summarized below.

Few adverse impacts to the wildlife species noted above would occur; therefore, no mitigation measures would be required except for the bald eagle winter roost site and the implementation of BMPs for the Virgin River chub, woundfin, and other state sensitive fish species. However, given that construction of the project might not occur until 2006, another field survey of the area would be conducted before construction to determine the presence of any threatened and endangered species in the project corridor. Although impacts to the desert tortoise and southwestern willow flycatcher are not expected, potential mitigation measures are provided to ensure protection.

Bald Eagle. A bald eagle roost site exists in the project area for the 4300 West Alternative along SR 9 and the Hurricane sewer lagoons. Construction would be monitored from November 1 through March 31 if construction is within 0.5 mile of the winter roost site and the bald eagle is present. If the bald eagle appears disturbed, construction would cease within the 0.5 mile–buffer and the monitor would consult with USFWS. Project employees would be informed of the bald eagle’s presence and cautioned to minimize disturbance during the winter period.

Virgin River Chub, Woundfin, and Other State Sensitive Fish. Impacts to the Virgin River itself are not anticipated, but implementation of BMPs are the recommended mitigation for chub and woundfin. BMPs would provide effective erosion and sedimentation control across the project area and would include an effective revegetation plan. Examples of BMPs that might be appropriate for inclusion in design include revegetation and control of invasive plants, use of

equipment mats in areas with temporary or short-term disturbance during construction, and silt fences of geo-textile fabric stapled to well-placed stakes installed between the construction area and adjacent riparian areas as effective erosion and sedimentation control measures.

Desert Tortoise. Although the desert tortoise was not located in the project area, any tortoises found during construction would be relocated according to the Washington County Habitat Conservation Plan.

Southwestern Willow Flycatcher. This species is not known to occupy the project area. However, there is a possibility that, before or during construction, the flycatcher could occupy potential habitat near the highway next to the Virgin River in a limited area at the north end of Warner Ridge. UDOT will resurvey potential habitat during the 1-year period before construction. If the flycatcher is found, FHWA and UDOT will consult with USFWS.

4.14.3 Cumulative Impacts

Growth in Washington County is likely to occur with or without the Southern Corridor, and the interactions between the transportation alternatives and anticipated urban growth would likely create long-term cumulative impacts. OHVs are currently the greatest threat to threatened and endangered species, and other recreation activities (such as mountain biking) are expected to increase in the project area. Recreation impacts might not be associated with the highway itself but are likely to increase as development continues. Recreation in critical habitat areas could be controlled to some degree by proper planning before development.

Of the species listed above, the Southern Corridor is likely to directly affect bearclaw poppy and Holmgren milkvetch habitat and therefore they are included in the discussion on cumulative impacts. Although no direct impacts to the Siler cactus or desert tortoise are expected, these species are of concern in the project area and are also included. The geographic scope of the analysis is the habitat areas for the species listed below. The timeframe for the analysis starts with the large increase in growth in the area (1970s) and goes to the 2030 planning period for this EIS.

Bearclaw Poppy. As noted above, growth in Washington County would continue to affect bearclaw poppy habitat. Habitat loss has occurred over the last 30 years as a result of urban growth, increased use of OHVs, and other recreation. Table 4.14-2 below shows the acres of poppy habitat on federal, state, and private land. Habitat for this species is protected on federal land. The current baseline for this cumulative impact analysis is the 5,790 acres of existing habitat. The recent trend

for this species has been a decline in population. No threshold data were available for this species.

About 6.2 acres of poppy habitat (0.1% of total area habitat) is within the Southern Corridor ROW and would be affected by construction. Mitigation for affected habitat would be a one-for-one replacement in adjacent areas. Other projects in the area, including Sand Hollow Reservoir, the proposed St. George replacement airport, and the new interchange at RP 13, would not directly affect the poppy. However, these projects and the Southern Corridor are being implemented to support future growth in the area, and continued growth would be the primary impact to this species.

As shown in Table 4.14-2, about 63% of poppy habitat is on BLM-administered land, 36% is on state land, and 1% is on private land. BLM would continue to implement management to protect this species. One of the benefits to this species from the Southern Corridor is that the highway would allow BLM to better manage OHV access along Warner Ridge, which should reduce long-term impacts. The 37% of poppy habitat on state and private land has no protection and is likely to be developed. For example, the area around the proposed connector road north of the proposed Atkinville interchange contains poppy habitat and is slated for commercial development. Overall, continued loss of poppy habitat on state and private land could threaten this species.

Table 4.14-2. Land Ownership Acres for Holmgren Milkvetch and Bearclaw Poppy Habitat

Ownership	Holmgren Milkvetch	Bearclaw Poppy
BLM	1,926	3,650
State	2,484	2,060
Private	0	80
Total	4,410	5,790
Source: BLM 2001c		

Holmgren Milkvetch. Habitat loss has occurred over the last 30 years as a result of urban growth, increased use of OHVs and other recreation, grazing, displacement by exotic weeds, and mineral development. In addition, this species' specificity to a particular geologic formation and low reproductive output are likely to make it extremely vulnerable to human disturbance.

Table 4.14-2 above shows the acres of Holmgren milkvetch habitat on federal, state, and private land. Habitat for this species is protected on federal land. The current baseline for this cumulative impact analysis is the 4,410 acres of existing habitat. The recent trend for this species has been a decline in population. No threshold data were available for this species.

About 2.3 acres of milkvetch habitat (0.05% of total area habitat) are within the ROW and would be affected by construction. Mitigation for affected habitat would be a one-for-one replacement in adjacent areas. Other projects in the area, including Sand Hollow Reservoir, the proposed St. George replacement airport, and the new interchange at RP 13, would not directly affect milkvetch habitat. However, these projects and the Southern Corridor are being implemented to support future growth in the area, and continued growth would be the primary impact to this species.

As shown above in Table 4.14-2, about 44% of milkvetch habitat is on BLM-administered land and 66% is on state land. BLM would continue to implement management to protect this species. Sixty-six percent of habitat on state land has no protection and is likely to be developed. For example, some habitat on state land at the southern end of St. George is proposed for commercial, industrial, and residential development. Potential development on state land, the species' affinity for a particular geologic formation, and its low reproductive output make this species vulnerable to human threats, which could affect its long-term viability.

Siler Cactus. No Siler cactus were observed in the ROW; therefore, no direct impacts would occur. However, the anticipated growth in both population and recreational uses is likely to affect species habitat. The cactus has been threatened by mining, extensive OHV use, livestock trampling, and loss of plants by overcollecting (Washington County Commission 1995).

About 35 acres of cactus habitat (4%) are on private land and 811 acres of habitat (96%) are on BLM-administered lands. BLM would continue to implement management to protect this species. One of the benefits of the Southern Corridor for this species is that the highway would allow BLM to better manage OHV access along Warner Ridge, which should reduce long-term impacts.

Desert Tortoise. Washington County has one of the highest densities of Mojave desert tortoises in the United States. The distribution of the desert tortoise extends from southern California into southern Nevada, northwestern Arizona, and southwestern Utah. The primary reason for listing the desert tortoise as threatened includes the cumulative impacts of deterioration and loss of habitat, collection for pets and other purposes, elevated levels of predation, and loss of desert tortoises from disease. Desert tortoise habitat in Washington County has become increasingly fragmented because of urban development, making it difficult for USFWS to adequately protect the species and its habitat (Washington County Commission 1995).

The proposed Southern Corridor is in an area of potential desert tortoise habitat (geographically isolated areas with no documented desert tortoise sign). No live

individuals, scat, burrows, or tracks were found during surveys conducted for the project; however, continued growth and development could potentially affect the species. To protect the desert tortoise while still allowing development to occur in Washington County, a Habitat Conservation Plan was prepared to provide a comprehensive approach to preserving and protecting desert tortoise habitat.

The Habitat Conservation Plan is part of Washington County's application for an incidental take permit for 1,169 animals and 12,264 acres of desert tortoise habitat. As part of the plan, a 61,022-acre reserve roughly north of St. George would be established. It is believed that the establishment of the reserve would ensure the survival and persistence of the desert tortoise in the Upper Virgin River Management Area and minimize potential cumulative impacts from continued development (Washington County Commission 1995). Desert tortoises found in the project area during construction activities would be moved into the Red Cliffs Desert Reserve.

4.14.3.1 Recommendations for Minimizing Cumulative Impacts

Methods of minimizing cumulative impacts to threatened and endangered species and habitats are similar to those described under Section 4.12, Water Body Modification and Wildlife Impacts. USFWS and BLM are working with the local cities and SITLA to identify and protect important habitat. SITLA, which owns much of the developable state land that contains threatened and endangered species habitat, is working with St. George to address potential impacts to the Holmgren milkvetch and bearclaw poppy in the southern extent of the city limits. SITLA is currently conducting studies to determine the extent of habitat on state land. Once the study is complete, a meeting should be held between USFWS, BLM, the City of St. George, and SITLA to manage critical habitat.

4.15 Impacts on Historic, Archaeological, and Paleontological Resources

As described in Section 3.15, Historic, Archaeological, and Paleontological Resources, an inventory and intensive-level survey of cultural and paleontological resources in the study area was conducted. The potential effects of the proposed project on potentially NRHP-eligible cultural resources were assessed, and the results are summarized below.

4.15.1 Cultural Resources

This section provides a summary of the impacts to NRHP-eligible cultural resources. Appendix H, Cultural and Paleontological Resources, provides an overview of the impacts to cultural resources. Table 4.15-1 provides a summary

of the impacts by build alternative. Within the area of potential effect for all of the alternatives, a total of 135 sites were identified of which 89 are considered eligible for the NRHP. Of these 89 sites, 77 were in the 4300 West area of potential effect, 9 were in the 3400 West area of potential effect, and 71 were in the 2800 West area of potential effect.

Table 4.15-1. Comparison of Impacts to Cultural Resources by Build Alternative

	4300 West Alternative	3400 West Alternative	2800 West Alternative
Total sites in corridor	77	69	71
NRHP-potentially eligible sites	37	40	32
Number of NRHP-eligible sites adversely affected	23	21	20

Native American Consultation. During the EIS process, the Hopi Cultural Preservation Office requested consultation with FHWA and BLM regarding the reburial of human remains during construction of the Southern Corridor. To address these concerns, FHWA and BLM met with the Hopi Tribe on February 24, 2003. As a result of this meeting, FHWA and BLM have committed to continue to coordinate with the Hopi Tribe and other Native American groups, such as the Cedar Band of Paiutes, that have expressed interest in the project.

4.15.1.1 No-Build Alternative

Under the No-Build Alternative, about 400 acres of new roadway pavement could be required. This could result in up to 13 sites being affected based on an average site density of 0.032 sites per acre (see Section 4.15.3, Cumulative Impacts). Using the same ratio of noneligible to potentially eligible sites for the Southern Corridor, about 8 sites could be potentially eligible for the NRHP. The cities that would be constructing these roads are required to comply with state cultural resource regulations to minimize or avoid impacts. Potential mitigation measures would be similar to those for the build alternatives (see Section 4.15.1.5).

4.15.1.2 4300 West Alternative

Under the 4300 West Alternative, 77 sites were identified of which 37 are considered potentially eligible for the NRHP. Of these sites, 23 would be adversely affected. Potential mitigation measures to minimize these impacts are addressed in Section 4.15.1.5.

4.15.1.3 3400 West Alternative

Under the 3400 West Alternative, 69 sites were identified of which 40 are considered potentially eligible for the NRHP. Of these sites, 21 would be adversely affected. Potential mitigation measures to minimize these impacts are addressed in Section 4.15.1.5.

4.15.1.4 2800 West Alternative

Under the 2800 West Alternative, 71 sites were identified of which 32 are considered potentially eligible for the NRHP. Of the sites, 20 would be adversely affected. Potential mitigation measures to minimize these impacts are addressed in Section 4.15.1.5.

4.15.1.5 Mitigation Measures

The adverse effects on historic properties will be taken into account by FHWA and UDOT through the execution of a Memorandum of Agreement in consultation with the Utah State Historic Preservation Office (SHPO), the federal Advisory Council on Historic Preservation, affected agencies, and consulting parties identified under Section 106 (see Appendix H, Cultural and Paleontological Resources). Temporary protective fencing will be erected on all unaffected parts of eligible sites that are next to construction.

4.15.2 Paleontological Resources

A paleontological survey of the project area was conducted and 13 sites were located, recorded, and rated. Of the 13 sites, 9 are rated critical, significant, or important in paleontological sensitivity. Table 4.15-2 provides a summary of the important to critical sites affected by the build alternatives. As seen in Table 4.15-2, one or more of the proposed build alignments could affect 5 of the 9 sensitive sites.

Table 4.15-2. Sensitivity of Paleontological Sites Impacted by Build Alternatives

Sensitivity of Site	4300 West Alternative	3400 West Alternative	2800 West Alternative
Important	42Ws193PT	42Ws193PT	42Ws193PT
	42Ws195T	42Ws195T	42Ws195T
Significant	42Ws209V	42Ws209V	42Ws205T
			42Ws209V
Critical	42Ws206T ^a	42Ws206T ^a	—

Only the sites with sensitivity ratings requiring mitigation (important, significant, critical) are shown.

^a This site is rated significant to critical.

4.15.2.1 No-Build Alternative

Under the No-Build Alternative, local arterial roads would be developed in place of the Southern Corridor. Given the high potential for paleontological resources in the area, some resources could be affected. Based on the number of sites found during the Southern Corridor paleontological survey, it is expected that up to four sites could be affected under the No-Build Alternative. Indirect impacts from development that would occur under both the No-Build and build alternatives could result in additional impacts to these resources. Potential mitigation measures would be similar to those for the build alternatives (see Section 4.15.2.5).

4.15.2.2 4300 West Alternative

Under the 4300 West Alternative, there would be impacts to four paleontological sites. Two sites are rated as important, one site is rated as significant, and one site is rated as significant to critical. Potential mitigation measures to minimize these impacts are addressed in Section 4.15.2.5.

4.15.2.3 3400 West Alternative

Under the 3400 West Alternative, there would be impacts to four paleontological sites. Two sites are rated as important, one site is rated as significant, and one site is rated as significant to critical. Potential mitigation measures to minimize these impacts are addressed in Section 4.15.2.5.

4.15.2.4 2800 West Alternative

Under the 2800 West Alternative, there would be impacts to four paleontological sites. Two sites are rated as important and two sites are rated as significant. Potential mitigation measures to minimize these impacts are addressed in Section 4.15.2.5.

4.15.2.5 Mitigation Measures

The build alternatives have the combined potential to adversely affect 5 of the 13 paleontological sites recorded in the project area. These 5 sites are rated critical, significant, or important in paleontological sensitivity. The recommended mitigation measure for each of the 5 sites follows.

4300 West Alternative

42Ws195T. This site is rated as important. A paleontologist should be onsite to monitor construction in the area to determine if other tracks are present.

42Ws193PT. This site is rated as important. A paleontologist should be onsite to monitor construction in the area to determine if other tracks are present.

42Ws206T. This site is rated as significant to critical. If this area is affected by construction, the previously identified tracks should be collected and the site should be explored for additional tracks. A qualified paleontologist should also monitor the area during construction. Because of the high potential for finding other tracks in this area, construction should be spot-monitored for tracks.

42Ws209V. This site is rated as significant. A paleontologist should monitor construction in the area. If area will be covered with fill during construction, the area should be further explored first to uncover any additional fossils.

3400 West Alternative

Under the 3400 West Alternative, potential mitigation to sites 42Ws195T, 42Ws193PT, 42Ws206T, and 42Ws209V would be the same as that for the 4300 West Alternative.

2800 West Alternative

Under the 2800 West Alternative, potential mitigation to sites 42Ws195T, 42Ws193PT, and 42Ws209V would be the same as that for the 4300 West Alternative.

42Ws205T. This site is rated as significant. A qualified paleontologist should monitor construction excavation activities.

4.15.3 Cumulative Impacts

Continued growth in Washington County and associated development along with the Southern Corridor project could result in cumulative impacts to cultural resources. The proposed Southern Corridor could directly affect up to 27 cultural resource sites. Other state and local projects that could result in impacts to cultural resources in the county include the RP 13 interchange (up to 2 sites) and Sand Hollow Reservoir (up to 17 sites) (Greystone 1997b). Management of cultural resources under these projects would follow appropriate federal and state regulations. Overall impacts from development in Washington County are addressed below.

Modern development in Washington County and southeastern Utah (the geographic boundary of the analysis), starting with Mormon settlers, has resulted in impacts to cultural resources as the area's land uses have changed from undeveloped to developed. The timeframe for the analysis is from the early 1900s to the 2030 planning period for this EIS. It is estimated that over 10,000

Anasazi and prehistoric sites could occur on public lands in Washington County alone, and that number is the baseline for this cumulative impact analysis.

Although these resources are protected by a variety of state and federal laws, the condition of these resources throughout the county is only fair because of extensive looting and vandalism. A 1987 report by GAO indicated that two-thirds of all Anasazi structural sites have been disturbed throughout the region. Local observers have noted that all known large sites on public lands in the area have been vandalized (BLM 1998).

Land development and an increase in recreation activities would result in the cumulative loss of cultural resources. Because the number of sites that exist in the study boundary is unknown, it is difficult to anticipate how these sites would be affected. However, to provide an estimate of potential cumulative impacts from development that would occur in the area (St. George, Washington City, Hurricane, Santa Clara, Ivins, La Verkin, Virgin, and Toquerville), the number of archaeological sites per acre was developed based on the survey conducted for the Southern Corridor.

The results of the approximately 4,000-acre survey showed that the average site density is 0.032 sites per acre. Based on about 84,700 acres of land available for development in the project area, up to 2,700 NRHP-eligible/noneligible sites could be affected by future development. The Southern Corridor would result in less than 3% of the total sites affected and therefore would not be the major contributor to cumulative impacts.

Potential cumulative impacts from projects such as the proposed St. George replacement airport and Sand Hollow Reservoir would be minimized by coordination with SHPO; however, some sites would be lost through data recovery. Planned development on state and federal land would be required to follow cultural resource regulations for minimizing the potential for cumulative impacts. BLM is collaborating with local communities, local and state agencies, Native American tribes, and other interested parties in the region to develop and implement plans for restoration, stabilization, protection, and/or interpretation of cultural resources in the area (BLM 1998).

4.15.3.1 Recommendations for Minimizing Cumulative Impacts

The local cities should ensure that private developers survey project areas for cultural resources before construction and require that they follow appropriate state regulations for minimizing impacts. Other measures to reduce the amount of acres required for development should also be implemented (see Section 4.1, Land Use Impacts). Reducing the land area required for development would minimize potential cumulative cultural resource impacts. For example, if smart

growth were implemented in the study area (see Chapter 6, Smart Growth), less land area would be required for development and about 500 fewer sites would be affected, based on 0.032 sites per acre in the area.

4.16 Hazardous Waste Site Impacts

No properties near the Southern Corridor were identified as containing hazardous waste. Section 3.16, Hazardous Waste Sites, identifies suspect properties that potentially contain hazardous wastes and might require additional investigations before ROW acquisition. This section discusses the potential impacts to those properties under each of the Southern Corridor alternatives.

Table 4.16-1 lists the properties suspected of containing hazardous wastes and the various Southern Corridor alternatives potentially affected by each property. See Figure 3-15, Potential Hazardous Waste Sites, for the approximate location of each site.

Table 4.16-1. Suspected Hazardous Waste Sites along the Southern Corridor Alternatives

Suspect Property	Alternative		
	4300 West	3400 West	2800 West
Underground storage tank at Southern Corridor/I-15 interchange	•	•	•
Materials in washes near Klein Properties development	•	•	•
Scrap yard near Washington Fields	•	•	•
Willow Springs farm	•	•	
Flora Tech Road farms		•	
Underground storage tank at Southern Corridor/SR 9 interchange	•		

4.16.1 No-Build Alternative

Under the No-Build Alternative, local roads would be constructed to support expected development, but these roads would not directly contribute to additional hazardous waste sites. However, future commercial and industrial development in the study area could create additional hazardous waste sites. The regulatory climate for hazardous material users and waste generators has created an economic incentive to prevent uncontrolled releases. Because the type of future commercial and industrial development is unknown, the type of potential impacts cannot be quantified. Under the No-Build Alternative, an underground storage tank near River Road, a leaking underground storage tank, and a farm near Flora Tech Road could be affected.

4.16.2 4300 West Alternative

The ROW for the 4300 West Alternative would include suspect areas near the Klein Properties development, the scrap yard near Washington Fields, and the farm near Willow Springs. There is an underground storage tank near the Southern Corridor interchange with SR 9. This tank is monitored by UDEQ and is not expected to present a hazardous material threat. According to UDEQ, the underground storage tank near Southern Corridor's interchange with I-15 is permanently out of service. During construction there would be potential to disturb these sites, which could affect worker safety and the environment.

4.16.3 3400 West Alternative

The ROW for the 3400 West Alternative includes areas near the Klein Properties development, the scrap yard near Washington Fields, and farms near Willow Springs and along Flora Tech Road. During construction there would be potential to disturb these sites, which could affect worker safety and the environment.

4.16.4 2800 West Alternative

The ROW for the 2800 West Alternative includes areas near the Klein Properties development, the scrap yard near Washington Fields, and the farm near Willow Springs. During construction there would be potential to disturb these sites, which could affect worker safety and the environment.

4.16.5 Mitigation Measures

UDOT policy is to conduct an Environmental Assessment before ROW acquisition. If a previously unidentified hazardous waste site is encountered, UDOT (or the construction contractor) would be required to complete a remedial work plan to clean up the site with approval from UDEQ and/or EPA.

4.17 Visual Impacts

Impacts on visual quality are based on FHWA guidelines and the BLM's VRM class objectives. Following the FHWA Technical Advisory, impacts to existing visual resources are identified by the relationship to potential views of and from the road. Measures to avoid, minimize, or reduce the adverse impacts are also identified. Impacts that directly conflict with BLM VRM class objectives are noted.

- The objective of VRM Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities might be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities could attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- The objective of VRM Class IV is to provide for management activities that require major modification of the existing character of the landscape where the level of change to the characteristic landscape can be high. These management activities could dominate the view and be the major focus of view attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements of the landscape (BLM 1998).

4.17.1 Construction-Related Impacts

4.17.1.1 No-Build Alternative

The visual impacts of the No-Build Alternative would include future residential, commercial, industrial, and recreational growth. The continued construction would change the visual quality of the study area. Currently, the study area provides views of the Pine Valley Mountains, Beaver Dam Mountains, White Dome, Warner Ridge, Warner Valley, Virgin River, Washington Dome, Sand Mountain, Hurricane Cliffs, Sullivan Knoll, and the development of Sand Hollow Reservoir. White Dome and Warner Ridge are two visual resource areas that have been altered from heavy OHV use. The planned residential, commercial,

industrial, and recreational growth will change the visual resources of the area from a rural to built environment. Various city transportation and other infrastructure projects would cause additional visual impacts.

4.17.1.2 Build Alternatives

Unless noted otherwise in the following discussion, the construction impacts on the visual resources in the study area would be similar for all build alternatives. Potential indirect impacts from regional growth would be similar to those for the No-Build Alternative.

Visual impacts would be considerably greater during construction than afterward for several reasons. During construction, the alignment would be cleared of vegetation. The exposed bare ground would likely contrast visually with the surrounding agricultural, residential, and/or municipality areas that the viewer is accustomed to seeing. Until the construction is completed and the ROW is revegetated, the construction area would stand out. Also, movement of large construction vehicles would draw the attention of viewers.

Construction-related visual impacts would be the greatest at the interchange areas of I-15 and SR 9. I-15 and SR 9 users would see construction activities every time they use the highway. Construction would take place on both sides of the highway. The speed of vehicles would also decrease in this area, thus increasing viewing time. Where the proposed project is farther from large viewer groups, its construction-related visual impacts would be apparent to fewer people.

4.17.2 Proposed Project Viewed from Offsite

4.17.2.1 No-Build Alternative

The visual impacts of the No-Build Alternative would come from the continued residential, commercial, industrial, and recreational developments in the study area. The project area is located in an undeveloped part of Washington County south and east of I-15. Most future development would occur near the replacement airport location and north toward SR 9. The development that would occur under the No-Build Alternative would alter the visual quality for the described viewsheds from a rural to a built environment. Distant vistas in the study area of the red rock cliffs and mountains would remain unchanged.

4.17.2.2 Build Alternatives

The Southern Corridor would cause visual impacts to 10 offsite areas. Visual impacts were assessed from KOPs (or viewpoints) as described in Section 3.17, Visual Resources, and as shown in Appendix E, Key Observation Point

Photographs. Generally, these KOPs are described in the following text in groups from south to north.

The 10 viewsheds in the study area consist of open space. Future residential, commercial, and recreational land uses would alter the existing visual environment as described under the No-Build Alternative. The Southern Corridor would alter the viewshed for recreational users and the few residences at the north end of the study area near SR 9.

However, the Southern Corridor would not alter the viewshed for future residential and recreational users who would move to the area as part of the expected growth. For this population, the development that would occur south and east of I-15 and the Southern Corridor would be part of the existing viewshed. Potential indirect impacts from regional growth would be similar to those for the No-Build Alternative.

4300 West Alternative

White Dome (KOP 1). The primary viewer group for this KOP is OHV users. This area is closed to OHV use due to environmental concerns, but unauthorized use still occurs. Excessive OHV use has altered the scenic beauty of this viewshed. Therefore, the proposed Southern Corridor would not cause any additional impacts to this area.

Long Vista View and Warner Ridge/Warner Valley–Virgin River Floodplain (KOPs 2 and 3). The primary viewer groups for these KOPs are OHV users and Anasazi Mountain Men visiting the winter rendezvous site. KOP 2 is located in VRM Classes III and IV (see Section 4.17). KOP 3 is located in VRM Classes II and IV. The proposed Southern Corridor requires cutting through the north edge of Warner Ridge. This would cause a visual impact to OHV users.

Vista View and SR 9 (KOPs 9 and 10). The primary viewer groups for KOP 9 are motorists traveling on SR 9 and farmers/homeowners of the pecan orchards. KOP 10 is located at the SR 9 connection, just south of commercial and residential development. The primary viewer groups for this area are motorists traveling along SR 9 and homeowners. The Southern Corridor would alter the viewshed from a natural to a built environment.

3400 West Alternative

This alternative would have the same potential visual impacts on KOPs 1, 2, and 3 as the 4300 West Alternative. Additional impacts for the 3400 West Alternative are described below.

Outlaw Ridge–Dixie Springs (KOP 4). The primary viewer groups of this area are farmers/homeowners of the pecan orchards. The two planned developments that would alter this viewshed are the proposed Outlaw Ridge and Dixie Springs. The Southern Corridor would alter the viewshed from a natural to a built environment.

2800 West Alternative

This alternative would have the same potential visual impacts on KOPs 1, 2, and 3 as the 4300 West Alternative. Additional impacts for the 2800 West Alternative are described below.

Sand Dunes and Sand Hollow Reservoir (KOPs 5 and 6). The primary viewer group for this area is recreationists. KOP 5 is located in VRM Class IV. Currently this area is used by OHVs, but with the development of Sand Hollow Reservoir, this use would expand to water-based recreation, OHV use, equestrian activities, hiking, biking, and camping, among others. Currently the land is open space; the proposed Southern Corridor would follow the outer boundary of the reservoir. Sand Hollow Reservoir and a transportation facility would change the current viewshed.

Sullivan Knoll and State Road 9 (KOPs 7 and 8). The primary viewer group for this area is motorists traveling along SR 9. Currently this area is open space and is owned by a private landowner. The Southern Corridor would alter the viewshed from a natural to a built environment.

4.17.2.3 Mitigation Measures

The highway ROW would be revegetated with native plants, which would help soften the visual impacts of the highway and blend it into the landscape. The work would be completed as soon after construction as possible.

4.17.3 Visual Impact Ratings

Table 4.17-1 presents the contrast (impact) ratings at each onsite KOP (that is, views from the corridor). Contrast ratings are a measure of how the visual characteristics of a given view differ from those of the proposed highway structures compared to the same view without the structures.

Table 4.17-1. Visual Impact Ratings—Onsite

KOP	Impact Rating	Alternative Location of KOP
1	1.5	All
2	1.5	All
3	2	All
4	1.34	3400 West
5	2	2800 West
6	1.25	2800 West
7	1.34	2800 West
8	1.34	2800 West
9	1.5	4300 West
10	1.17	4300 West
Total Impact Rating per Alternative		
4300 West	1.53	
3400 West	1.59	
2800 West	1.56	
Ratings are based on BLM's Visual Resources Contract Rating System and use a scale of 1 to 4, with 4 representing the greatest contrast (impact).		

The visual analysis evaluates and rates four specific visual characteristics: form, line, color, and texture. Each characteristic is rated on a scale of 1 to 4 to indicate how much it would change with the addition of the highway. A rating of 1 represents little or no change; a rating of 4 represents a major change. These characteristics are rated relative to three components of the view: land and water body elements, vegetation, and structures. The overall values reported above in Table 4.17-1 are the averages of all the ratings for each KOP. This value measures how much the view changes. It does not measure whether the view is more or less aesthetically pleasing, because that is a subjective judgment.

4.17.4 Views from the Southern Corridor

4.17.4.1 No-Build Alternative

Since there would be no Southern Corridor under the No-Build Alternative, this view is not analyzed.

4.17.4.2 Build Alternatives

The greatest visual impact of the proposed project would be the highway itself. The highway paving materials are very smooth and dark and extend linearly. The visual impacts of the contrast of the paving material with the predominantly desert colors of the study area would be evident. The eye is drawn to the smooth, dark paving material and is held for the length of the highway until something either frames the view (such as an overpass) or until something changes the straight line of the highway (such as a curve in the alignment). The longer and straighter the section of highway where the highway is not framed or the alignment does not stop the view, the greater would be the visual impacts.

There are many eye-catching geographical features and colors in the project area. The only geographical impact would be the north section of Warner Ridge. The highway is planned to parallel the ridge and curve up and through the north section. However, the land is designated BLM VRM Classes III and IV (see Section 4.17), which means that disturbing activities could be authorized and would not be limited to proposed developments, but would be subject to BLM reclamation standards.

4.17.4.3 Mitigation Measures

The highway ROW would be revegetated with native plants, which would help soften the visual impacts of the highway and blend it into the landscape. The work would be completed as soon after construction as possible.

4.18 Energy Impacts

4.18.1 Direct Impacts

The dominant energy source of the transportation sector is petroleum, and nearly two-thirds of the petroleum consumed in the United States is for transportation. Of the total energy used for transportation, 75% occurs on highways. Of the highway energy use, 80% is used by automobiles, motorcycles, and light trucks. The remaining 20% is used by heavy trucks and buses.

Fuel consumption varies with traffic characteristics. The primary traffic characteristics are traffic flow (average vehicle speed), driver behavior, the geometric configuration of the highway, the vehicle mix, and climate and weather. Traffic modeling by the Oak Ridge National Laboratory suggests that, of all the traffic-related factors, average vehicle speed accounts for most of the variability in fuel consumption and is a good predictor of fuel economy for most urban travel. Fuel efficiency under steady-flow “cruising” driving conditions peaks at 35 to 45 mph and then rapidly declines as speeds increase. At lower speeds, fuel efficiency is reduced by engine friction, tires, use of powered accessories (for example, power steering and air conditioning), and repeated braking and acceleration (Davis and Hu 1991).

4.18.1.1 No-Build Alternative

Increased congestion and stop-and-go traffic under the No-Build Alternative would increase the overall energy requirements in St. George and the surrounding areas.

4.18.1.2 Build Alternatives

The build alternatives would relieve some congestion from arterial streets and would increase average vehicle speeds and smooth traffic flows. The build alternatives would have the greatest effect on the fuel economy factors related to travel conditions and driver behavior. It is not anticipated that the overall decrease in energy consumption would produce any noticeable benefit, nor would it cause or contribute to additional energy problems.

4.18.2 Construction-Related Energy Impacts

4.18.2.1 No-Build Alternative

Without the Southern Corridor, local and state entities would need to construct projects to alleviate the area’s transportation problems. These projects would require substantial energy resources for machinery and materials. Because the overall amount of new pavement required would be less under the No-Build Alternative than under the build alternatives, less energy would be consumed.

4.18.2.2 Build Alternatives

Constructing any of the Southern Corridor build alternatives would involve the operation of heavy machinery with a resulting impact on energy usage. Because of its extra length (4 miles), the 2800 West Alternative would consume the most energy during construction, followed by the 3400 West Alternative and the 4300 West Alternative.

4.19 Construction Impacts

Construction of any build alternative, including associated improvements and modifications to existing streets and highways, would cause temporary construction-related impacts resulting from ground disturbance and the operation of construction equipment. Possible impacts could occur to air quality, noise, water quality, wetlands, wildlife, cultural resources, visual resources, business operations, utility service, and traffic flow. The nature and timing of these impacts would be related to the project's construction methods and sequencing.

4.19.1 No-Build Alternative

Under this alternative, none of the build alternatives would be constructed. Development in the study area would occur over the next 20 years and would require new arterial transportation projects to support this growth. These projects would result in short-term impacts on air quality, noise, water quality, and other resources, although perhaps of a different level and duration than under the build alternatives. The type of construction impacts would be similar to the build alternatives though with a lesser extent.

4.19.2 Build Alternatives

All build alternatives would entail new construction, mainly in undeveloped areas. The following construction-related impacts apply to all alternatives unless stated otherwise.

Air Quality Impacts. Air quality impacts during construction would be limited to short-term increases of fugitive dust, particulates, and mobile source emissions.

- Fugitive dust is dust generated by construction equipment such as haul trucks and earth-moving vehicles.
- Particulates are matter resuspended by vehicle movement over paved and unpaved surfaces, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.
- Mobile source emissions are increased CO emissions from vehicles whose speeds are slowed due to the increased congestion caused by the construction activity.

Water Quality Impacts. Water quality impacts during construction could result from soil erosion caused by excavation, grading, and other activities. These conditions would exist until the proposed project is completed and permanent protective measures are installed. Measures for mitigating these temporary impacts are described in Section 4.10, Water Quality Impacts.

Wetland Impacts. There would be no wetland impacts from any of the build alternatives.

Noise and Light Impacts. The operation of machinery and other construction activities would create noise and light impacts. Lighting needed for nighttime construction would potentially affect a few residential homeowners. Impacts would be higher for the 4300 West and 3400 West Alternatives than for the 2800 West Alternative because of their proximity to a few homes.

Cultural Resource Impacts. During construction, additional archaeological, paleontological, or historical resources might be discovered other than those identified during the cultural resource surveys (see Section 3.15, Historic, Archaeological, and Paleontological Resources). In that case, construction in the area of the discovery would immediately stop. The contractor would notify UDOT of the nature and exact location of the finding and would not damage or remove the resource.

Work would be delayed until UDOT evaluates the extent and cultural significance of the site. The course of action and the construction delay could vary depending on the nature and location of the discovery. Construction would not resume until the contractor receives written authorization from UDOT to continue.

Traffic Impacts. The contractor would be required to develop a maintenance of traffic plan that defines measures to minimize impacts on traffic on existing roads. A requirement of this plan is that, to the extent possible, access to businesses and residences must be maintained and existing roads must be kept open to traffic unless alternate routes are provided.

Short-term increases in traffic congestion would occur where new interchanges would be constructed to connect to the existing highway system. The congestion would result from contractors working along the road edges to widen the existing pavement and to provide new lanes or connect new ramps. Closures would be short and limited to what is specified in the maintenance of traffic plan as approved by UDOT before the start of construction.

Wildlife Impacts. Construction activity tends to have a great, though temporary, effect on wildlife in or near the ROW because of higher noise levels, construction equipment activity, lights, and other effects. Such activities are of particular concern during nesting periods for migratory birds near the ROW. See Section 4.12, Water Body Modification and Wildlife Impacts, and Section 4.14, Threatened and Endangered Species Impacts, for more information.

Utility Service Impacts. UDOT would consult with all utilities affected by construction of the highway to complete utility agreements before construction.

Utility service would be maintained throughout most construction activity, but there could be short, scheduled interruptions in service for line relocations according to the utility agreements. There is a potential for brief accidental disruptions of service.

Visual Impacts. Visual impacts from construction are discussed in Section 4.17.1, Construction-Related Impacts.

Mitigation Measures. A thorough public information program would be implemented to alert the community of construction activities and to minimize impacts. Information would include work hours in areas where construction is needed to connect to the existing highways and alternate routes. Construction signs would be used to notify motorists about work activities and changes in traffic patterns. In addition, night and weekend work could be scheduled to shorten the duration of construction impacts as long as permit requirements are satisfied.

Impacts from lights used during nighttime construction would be minimized by aiming construction lights directly at the work area and/or shielding the lights to avoid disturbing nearby residences. Construction activities would be limited at certain times to protect threatened and endangered species. Utility agreements would be completed to coordinate utility relocation.

4.20 Short-Term Uses versus Long-Term Productivity

The short-term use of the environment versus preserving its long-term productivity relates to converting the natural productivity of the land, viewed as a renewable use, to a developed use that has a relatively short economic life. The long-term, natural productivity of the Southern Corridor project area comes from range land and some agricultural land within the ROW, along with the wildlife productivity and vegetation habitat that exist along the study area and adjacent land.

These resources would be replaced by the relatively short-term use of the land for the Southern Corridor. However, these losses are similar to those that would occur if the project were not constructed, due to the ongoing development of the study area.

These short-term uses of the environment by the Southern Corridor would be generally consistent with local land use and transportation plans and would be expected based on regional projections of population growth. The uses would be the same for the No-Build and build alternatives. There is little difference between the alternatives, and the proposed project would be consistent with maintaining and enhancing productivity as defined by local governments.

4.21 Irreversible and Irretrievable Commitment of Resources

Implementation of a build alternative involves a commitment of a range of natural, physical, human, and fiscal resources. Land used for the construction of the Southern Corridor would be considered an irreversible commitment of these resources during the time that the land is used for the highway. However, if a greater need for use of the land arises, or if the highway is no longer needed, the land could be converted to another use.

A considerable amount of fossil fuels, labor, and highway construction materials such as cement, aggregate, and bituminous material would be expended. Additionally, large amounts of labor and natural resources would be necessary for fabricating and preparing the construction materials. These materials are generally not retrievable; however, they are not in short supply and their use would not have an adverse effect on the continued availability of these resources.

Construction of the proposed project would also require a substantial expenditure of irretrievable funds. The commitment of these resources is based on the premise that residents in the area, the state, and the region would benefit by the improved quality of the transportation system. These benefits would consist of improved accessibility, increased safety, and savings in travel time, all of which are anticipated to outweigh the commitment of these resources.

4.22 Permits and Clearances

Table 4.22-1 shows permits and clearances that would be required for the Southern Corridor. These permits and clearances apply to all build alternatives.

Table 4.22-1. Required Permits and Clearances

Permit	Granting Agency(s)	Applicant	Application Time	Granting Time	Application Portion of Project
Floodplain Development Permit	Local Jurisdictions	UDOT (prepared by contractor)	Construction Phase	Construction Phase	Portions of roadway or structure in FEMA floodplain
Nationwide 14 (Linear Transportation Crossings)	COE	UDOT	Construction Phase	Construction Phase	Portions of roadway or structure in wetlands/ waters of the U.S.
Stream Alteration Permit (potentially)	UDNR, Division of Water Rights	UDOT (prepared by contractor)	Construction Phase	Prior to Construction	Required if contractor proposes changes to stream crossing designs
Section 402 Permit (UPDES)	UDEQ, Division of Water Quality	Contractor	Construction Phase	Before Construction	Storm water quality during construction phrase

Permit	Granting Agency(s)	Applicant	Application Time	Granting Time	Application Portion of Project
Approval of Addition or Modification of Access Points	FHWA	UDOT	EIS Phase	Concurrent with Record of Decision	Interstate access changes
Air Quality Approval Order	UDEQ, Division of Air Quality	Contractor	Construction Phase	Before Construction	Air quality during construction phase (emissions from equipment)
Water Rights (change deed record or apply for change in point of diversion)	UDNR, Division of Wildlife Resources	UDOT	ROW Acquisition Phase	ROW Acquisition Phase	Changes in point of diversion or change of use associated with wells in the ROW or water required for wetland mitigation
Permit to Take	USFWS	UDOT	EIS Phase	Final EIS	Impacts on threatened and endangered species
Section 106 of the National Historic Preservation Act	SHPO and Advisory Council on Historic Preservation	UDOT	Concurrent with EIS	Final EIS	Mitigation of historic and archaeological resources
Memorandum of Agreement (potentially)	SHPO and Advisory Council on Historic Preservation	UDOT	EIS Phase	Final EIS	Impacts on NRHP properties
UDEQ/EPA Approval of Remediation Work Plan (potentially)	UDEQ or EPA	UDOT	EIS Phase	Before Construction	Hazardous waste, CERCLA, and NPL sites
Construction-related permits for all of the above (potentially)	Various Agencies	Contractor	Contractor	Before Construction	Impacts associated with offsite activities such as construction staging, borrow areas, batch plant sites, and so on
Material Site ROW Permit	BLM	UDOT (prepared by contractor)	Prior to Use	Before Use	Required if fill will be taken from areas with BLM mineral reservations
All of the listed permits would be required or potentially required for construction of the Southern Corridor under all build alternatives and options.					

4.22.1 Floodplain Development Permit (Local Jurisdictions)

Washington County and the cities in the study area have adopted FEMA's National Flood Insurance Program. This program includes the preparation of flood insurance rate maps that depict the 100-year floodplain boundaries for each of the streams crossed by the highway alignments.

Construction of all build alternatives would overlap the 100-year floodplains for numerous dry washes, such as the Fort Pearce Wash. Building any of the alternatives and options would involve placing highway fill and drainage structures in some washes. In accordance with Executive Order 11988, Floodplain Management, coordination with FEMA would be required during the construction phase to ensure that the 100-year flood design standards are met and to obtain the Floodplain Development Permit from the local community.

4.22.2 Nationwide 14 Linear Transportation Crossings (COE)

The Nationwide 14 permit allows activities required for construction, expansion, modification, or improvement of linear transportation crossings (such as highways, railways, trails, and airport runways and taxiways) in the waters of the United States, including wetlands, provided the activity does not cause the loss of more than 0.5 acre and does not exceed 200 linear feet (U.S. Army Corps of Engineers 2001).

4.22.3 Utah State Stream Alteration Permit (UDNR, Division of Water Rights)

Constructing the drainage structures at each stream crossing under the build alternatives and options would constitute a major stream alteration or modification. A Stream Alteration Permit from the Division of Water Rights would be required for each stream crossing.

4.22.4 Section 402 Permit, Utah Pollution Discharge Elimination System (UDEQ, Division of Air Quality)

Constructing any of the build alternatives and options would disturb more than 1 acre, and so would require a UPDES construction phase permit, issued in response to the 1987 reauthorization of the Clean Water Act. The Clean Water Act requires EPA to institute an NPDES permitting program for storm drainage systems or to approve state programs. EPA approved Utah's version of this program (UPDES) in 1987.

Obtaining the UPDES permit requires development of a Storm Water Pollution Prevention Plan that includes a Temporary Erosion and Sediment Control Plan.

The Temporary Erosion and Sediment Control Plan identifies BMPs as well as site-specific measures to minimize erosion and prevent eroded sediment from leaving the work zone.

4.22.5 Approval of Addition or Modification of Access Points (FHWA)

Changing access points to the interstate highway system requires approval from FHWA. All build alternatives and options would require access to I-15 in St. George and SR 9 in Hurricane.

4.22.6 Air Quality Approval Order (UDEQ, Division of Air Quality)

A permit for air quality impacts during the construction phase is required for all build alternatives. The intent of the permit is to control fugitive dust and emissions. This permit would be obtained by the contractor before construction. It would include requirements for a dust control plan to address emission sources and possibly other construction approvals depending on the source and location of aggregate, asphalt, combustion, and/or fuel storage facilities.

4.22.7 Water Rights (UDNR, Division of Water Rights)

Existing groundwater wells within the ROW inventoried by UDNR's Division of Water Rights are referred to as points of diversion. If the point of diversion is changed (that is, if the well is relocated outside the ROW), the owner of the well must file an application to UDNR to change the well. If UDOT purchases the water right associated with a well in the ROW, the deed record at UDNR would have to be changed.

4.22.8 Permit to Take (USFWS)

Section 7 consultation would be required if take of a threatened or endangered species is likely. Take of threatened and endangered species is prohibited by Section 9 of the Endangered Species Act. If a threatened or endangered species is likely to be adversely affected, formal consultation with USFWS would be initiated and an Incidental Take Statement would be included as part of the USFWS Biological Opinion. Incidental Take Statements exempt action agencies and their permittees from Section 9 prohibitions if they comply with the reasonable and prudent measures and implementation terms and conditions of the Incidental Take Statement.

4.22.9 Section 106 and Section 110 (National Historic Preservation Act)

Sections 106 and 110 of the National Historic Preservation Act require that historical and archeological resources be evaluated for eligibility for the NRHP

and that eligible resources that would be affected are preserved or documented. Consultation with SHPO has been conducted. A permit would be granted to UDOT by SHPO to perform recovery mitigation on eligible archaeological sites affected by the project.

4.22.10 Approval of Remediation Work Plan (UDEQ or EPA)

The build alternatives could affect an area with contaminated soils. Construction of the highway on any contaminated site would require a remediation work plan approved by the appropriate regulatory agency for each site (UDEQ or EPA). The plan would define cleanup levels and protective measures for construction workers.

4.22.11 Construction-Related Permits and Clearances (Various Agencies)

The contractor would be responsible for obtaining all construction-related permits and other environmental clearances for activities occurring outside the ROW, such as construction staging areas, borrow areas, and batch plant sites.

4.22.12 Material Site ROW Permit (BLM)

Use of BLM mineral reservations (for example, gravel for fill material) requires a Material Site ROW Permit from BLM. The permit must be issued directly to UDOT, not to a private contractor. If the land is purchased, minerals remain under BLM ownership and jurisdiction.

4.23 Mitigation Summary

All of the build alternatives require mitigation of some impacts. When siting a new facility, the general rule is first to try to avoid an environmental impact entirely. If avoidance is not possible, then minimizing the impact is the next preferred choice. Finally, if the impact cannot be fully avoided or minimized, mitigating the environmental impact is often recommended.

The main criterion used when siting the possible Southern Corridor alignments and developing the alignment alternatives was whether environmental impacts could be minimized or avoided. The alignment alternatives as developed avoid or minimize impacts to wetlands, cultural resources, relocations, and habitat for listed plant and wildlife species.

If impacts to a resource could not be avoided or minimized, potential mitigation measures were developed; these are summarized in Table 4.23-1. The USFWS biological opinion in Appendix C, Pertinent Correspondence, details the specific mitigation measures for threatened and endangered species.

Table 4.23-1. Mitigation Summary

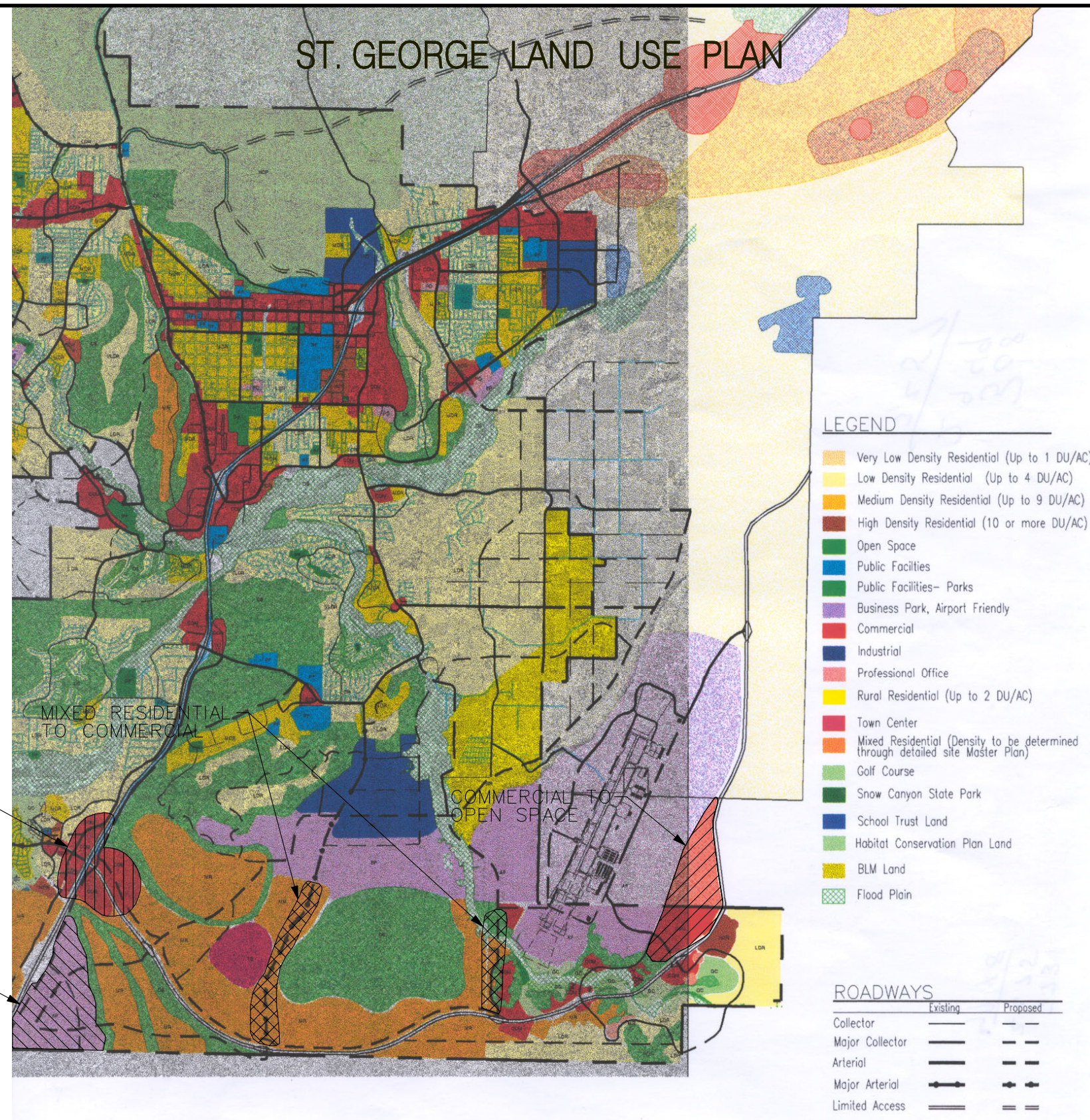
Impact Category	Mitigation Measures
Land Use	
Cities and Counties	(None)
Consistency with Plans and Policies	(None)
Farmland	
All Farmland	All Build Alternatives. Owners of farmland within the Southern Corridor ROW would be compensated according to the requirements of the URAA, as amended, and other state and federal guidelines.
Grazing Allotments	All Build Alternatives. When construction begins, the grazing permits would be terminated. The State of Utah is required to compensate the permit holder(s) for land improvements affected and lost AUMs.
Social Environment	
Socially Disadvantaged Groups (Environmental Justice)	All Build Alternatives. UDOT would ensure the use of BMPs to minimize and control substances that could cause adverse human health effects during construction.
Neighborhood and Community Cohesion	(None)
Travel Patterns and Accessibility	(None)
Public Facilities	(None)
Public Service and Utilities	(None)
Quality of Life	(None)
Public Health and Safety	(None)
Recreation Resources	All Build Alternatives. For affected recreation trails, trail markers directing trail users along overpasses or underpasses, using the Southern Corridor proposed trail, would be provided to allow continued use. 2800 West Alternative. UDOT would work with BLM and the Utah Division of Parks and Recreation to provide access between the Sand Hollow Reservoir and the Sand Hollow Recreation Area.
Relocation	
Residences	All Build Alternatives. Assistance and reestablishment expenses would be provided to the displaced property owners and lease holders according to eligibility requirements and other requirements of the URAA.
Farms	(None)
Economics	
Regional	(None)
Local	(None)
Joint Development	
Southern Corridor Trail	(None)
Pedestrians and Bicyclists	(None)

Impact Category	Mitigation Measures
Air Quality	<p>All Build Alternatives. Air emission mitigation measures for construction would be developed as part of the Emission Control Plan submitted to the State of Utah. Some of the measures would include the following:</p> <ul style="list-style-type: none"> • <i>Fugitive Dust Control.</i> The contractor would maintain a fugitive dust control program. This program would include wetting excavation areas, unpaved parking and staging areas, and onsite stockpiles of debris, dirt, or dusty material. • <i>Street Sweeping.</i> The contractor would use street-sweeping equipment at paved site access points. • <i>Equipment Emissions.</i> The contractor would shut off construction equipment when not in direct use to reduce idling.
Noise	<p>All Build Alternatives. No noise mitigation is planned at this time. The extent of the noise impacts would be determined during the design phase, and UDOT's current noise abatement policy would be applied.</p>
Water Quality	
Surface Water	<p>All Build Alternatives. More than 1 acre would be disturbed during construction. Therefore, a UPDES permit would be required. This permit would stipulate that the contractor design and implement measures, including BMPs, to limit the amount of eroded sediment that leaves the work area. BMPs would include the use of UDOT standard drawings for temporary erosion control. The Southern Corridor's design includes roadside ditches and retention basins designed to retain all runoff from a 10-year storm event.</p>
Groundwater Quality	(None)
Groundwater Rights and Wells	<p>All Build Alternatives. UDOT would either purchase the groundwater right from the owner or pay for a transfer of the right. Coordination would take place with owners of municipal wells to determine if the highway is consistent with the land management approach established in their Drinking Water Source Protection Plan.</p>
Wetlands/Waters of the U.S.	(None)
Water Bodies and Wildlife	
Water Bodies	(None)
Wildlife Habitat	<p>All Build Alternatives. Mitigation would include minimizing impacts to habitat by removing only vegetation that occurs within the construction ROW. Reclamation and revegetation would occur during road construction. UDOT would follow specifications outlined in Section 01574 of the UDOT <i>1999 Metric Standard Specifications for Road and Bridge Construction</i> to minimize construction impacts and manage the ROW for invasive species.</p>
Wildlife (Direct)	<p>All Build Alternatives. Areas disturbed by construction within the highway ROW would be revegetated after construction with native plant species.</p> <p>2800 West Alternative. Preconstruction surveys for golden eagles would be conducted in the project area where the active nest was noted. Nest monitoring would be conducted from January 1 to August 31 for any activities occurring within 0.5 mile of the nest. If golden eagles are disturbed in any manner, construction activities would stop and UDOT would immediately consult with USFWS and UDNR's Division of Wildlife Resources before resuming. Project employees would be informed of the presence of nesting golden eagles and cautioned to minimize disturbance.</p>
Wildlife (Indirect)	(None)
Floodplains	(None)

Impact Category	Mitigation Measures
Threatened and Endangered Species	
Plants	<p>All Build Alternatives. Because construction might not occur until 2006, the area would be resurveyed before construction for threatened and endangered plant species. All occupied endangered and threatened plant habitat within the ROW would be considered to be impacted and in need of replacement. The occupied habitat area of the plant species listed below would be defined as an area with a radius of 164 feet (50 meters) centered on each plant or plant cluster.</p> <ul style="list-style-type: none"> • <i>Bearclaw poppy.</i> Mitigation would consist of one-for-one conservation of habitat acreage impacted. Conservation would consist of purchasing and protecting in-kind habitat next to the Southern Corridor. The highway footprint would be minimized at both White Dome and Warner Ridge to limit direct construction impacts. Disturbing natural vegetation in the ROW would be limited to maintain the composition of native plant species and to protect ground-nesting pollinators. Disturbed ROW would be revegetated with native shrubs and grasses. In addition, road signs would be posted in habitat areas to notify UDOT maintenance crews to contact the regional environmental coordinator before performing any activities. • <i>Holmgren milkvetch.</i> Mitigation would consist of one-for-one conservation of habitat acreage impacted. Conservation would consist of purchasing and protecting in-kind habitat next to the Southern Corridor. A maximum 300-foot fenced ROW would be used to protect habitat directly adjacent to the highway, and the highway footprint would be minimized. Disturbing natural vegetation in the ROW would be restricted to maintain ground-nesting pollinators and the composition of native plant species. Disturbed ROW would be revegetated with native shrubs and grasses. In addition, road signs would be posted in habitat areas to notify UDOT maintenance crews to contact the regional environmental coordinator before performing any activities.
Wildlife	<p>All Build Alternatives. Because construction might not occur until 2006, the area would be resurveyed before construction for threatened and endangered wildlife species.</p> <ul style="list-style-type: none"> • <i>Virgin River chub and woundfin.</i> Impacts to the Virgin River itself are not anticipated, but implementation of BMPs are the recommended mitigation. BMPs would provide effective erosion and sedimentation control across the project area and would include an effective revegetation plan. Examples of BMPs that might be appropriate for inclusion in design include revegetation and control of invasive plants, use of equipment mats in areas with temporary or short-term disturbance during construction, and silt fences of geo-textile fabric stapled to well-placed stakes installed between the construction area and adjacent riparian areas as effective erosion and sedimentation control measures. • <i>Desert tortoise.</i> Although the desert tortoise was not located in the project area, any tortoises found during construction would be relocated according to the Washington County Habitat Conservation Plan. • <i>Southwestern willow flycatcher.</i> This species is not known to occupy the project area. However, there is a possibility that, before or during construction, the flycatcher could occupy potential habitat near the highway next to the Virgin River. UDOT will resurvey potential habitat during the 1-year period before construction. If the flycatcher is found, FHWA and UDOT will consult with USFWS.

Impact Category	Mitigation Measures
Wildlife (<i>continued</i>)	<p>4300 West Alternative</p> <ul style="list-style-type: none"> • <i>Bald eagle</i>. Construction would be monitored from November 1 through March 31 if construction is within 0.5 mile of the winter roost site and the bald eagle is present. If the bald eagle appears disturbed, construction would cease within the 0.5 mile–buffer and the monitor would consult with USFWS. Project employees would be informed of the bald eagle’s presence and cautioned to minimize disturbance during the winter period.
Historic and Archaeological Resources	
Cultural Resources	The adverse effects on historic properties will be taken into account by FHWA and UDOT through the execution of a Memorandum of Agreement in consultation with SHPO, the federal Advisory Council on Historic Preservation, affected agencies, and consulting parties identified under Section 106 (Appendix H, Cultural and Paleontological Resources). Temporary protective fencing will be erected on all unaffected parts of eligible sites that are next to construction.
Paleontological Resources	<p>All Build Alternatives</p> <ul style="list-style-type: none"> • <i>42Ws195T</i>. A paleontologist should be onsite to monitor construction in the area to determine if other tracks are present. • <i>42Ws193PT</i>. A paleontologist should be onsite to monitor construction in the area to determine if other tracks are present. • <i>42Ws206T</i>. If this area is affected by construction, the previously identified tracks should be collected and the site should be explored for additional tracks. A qualified paleontologist should also monitor the area during construction. Because of the high potential for finding other tracks in this area, construction should be spot-monitored for tracks. • <i>42Ws209V</i>. A paleontologist should monitor construction in the area. If area will be covered with fill during construction, the area should be further explored first to uncover any additional fossils. <p>2800 West Alternative. Potential mitigation to sites 42Ws195T, 42Ws193PT, and 42Ws209V would be the same as described above.</p> <ul style="list-style-type: none"> • <i>42Ws205T</i>. A qualified paleontologist should monitor construction excavation activities.
Hazardous Waste Sites	All Build Alternatives . UDOT policy is to conduct an Environmental Assessment before ROW acquisition. If a previously unidentified hazardous waste site is encountered, UDOT (or the construction contractor) would be required to complete a remedial work plan to clean up the site with approval from UDEQ and/or EPA.
Visual Resources	All Build Alternatives . The highway ROW would be revegetated with native plants, which would help soften the visual impacts of the highway and blend it into the landscape. The work would be completed as soon after construction as possible.
Energy	(None)
Construction	<p>All Build Alternatives. A thorough public information program would be implemented to alert the community of construction activities and to minimize impacts. Information would include work hours in areas where construction is needed to connect to the existing highways and alternate routes. Construction signs would be used to notify motorists about work activities and changes in traffic patterns. In addition, night and weekend work could be scheduled to shorten the duration of construction impacts as long as permit requirements are satisfied.</p> <p>Impacts from lights used during nighttime construction would be minimized by aiming construction lights directly at the work area and/or shielding the lights to avoid disturbing nearby residences. Construction activities would be limited at certain times to protect threatened and endangered species. Utility agreements would be completed to coordinate utility relocation.</p>

Impact Category	Mitigation Measures
Short-Term Uses vs. Long-Term Productivity	(None)
Irreversible and Irretrievable Commitment of Resources	(None)
Section 4(f)/6(f) Properties	2800 West Alternative, Sand Hollow Recreation Area. UDOT would work with the recreation managers to provide access through underpasses at key points along the alignment, allowing convenient movement between the reservoir and other developed recreation areas.



LEGEND

- Change From Commercial to Open Space
- Change From Industrial to Residential
- Change From Mixed Residential to Commercial
- Change From Commercial to Residential

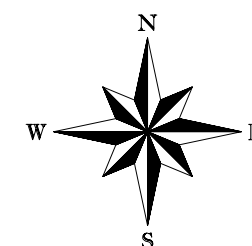
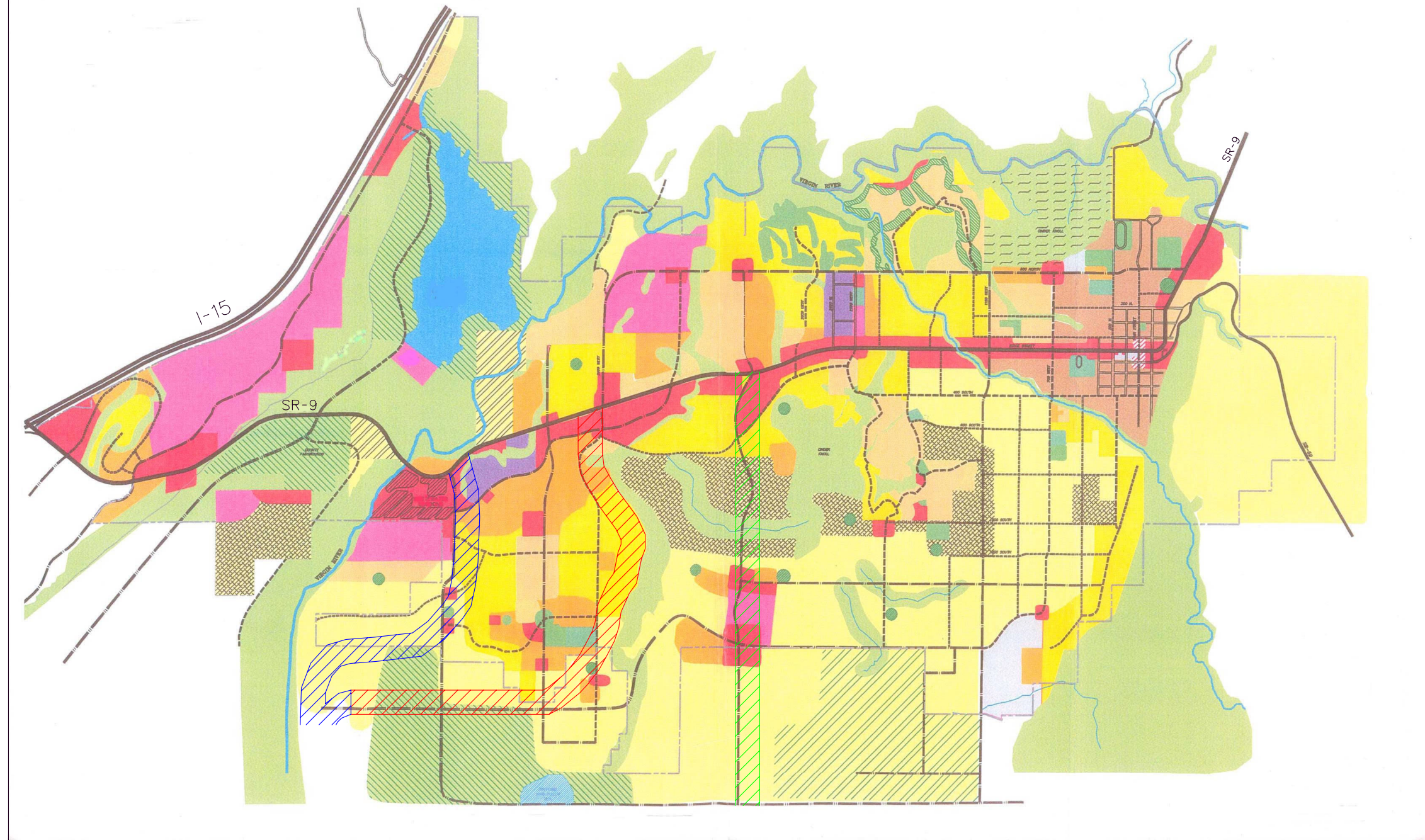


Figure 4-1 **ST. GEORGE LAND USE MAP** **NO-BUILD ALTERNATIVE**

Southern Corridor EIS
March 2003

HURRICANE CITY FUTURE LAND USE MAP



LEGEND

- General Commercial
- Pedestrian Oriented Commercial
- Business/Industrial
- Open Space
- Open Space w/ Recreational Use
- Community Parks & Recreation
- Public Education
- Public Land
- Research/Educational
- Traditional Neighborhood

- 2800 West - Change Residential/Open Space to Industrial/Commercial Land Uses
- 3400 West - Change Residential/Open Space to Industrial/Commercial Land Uses
- 4300 West - Change Residential to Industrial/Commercial Land Uses
- Very Low Density Single Family Residential/Agricultural Mixed Use (One Unit per 5 Acres)
- Very Low Density Single Family Residential/Agricultural Mixed Use (One Unit per 2.5 Acres)
- Very Low Density Single Family Residential/Agricultural Mixed Use (One Unit per Acre)
- Low Density Single Family Residential/Agricultural Mixed Use (1-2 Units per Acre)
- Medium Density Single Family Residential (2-3 Units per Acre)
- High Density Single Family Residential (3-6 Units per Acre)
- High Density Multi-Family Residential (Townhouses, Apartments, 10-12 Units per Acre)
- Medium Density Multi-Family Residential (Townhouses, Apartments, 6-10 Units per Acre)

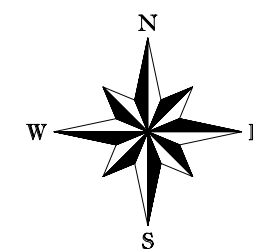
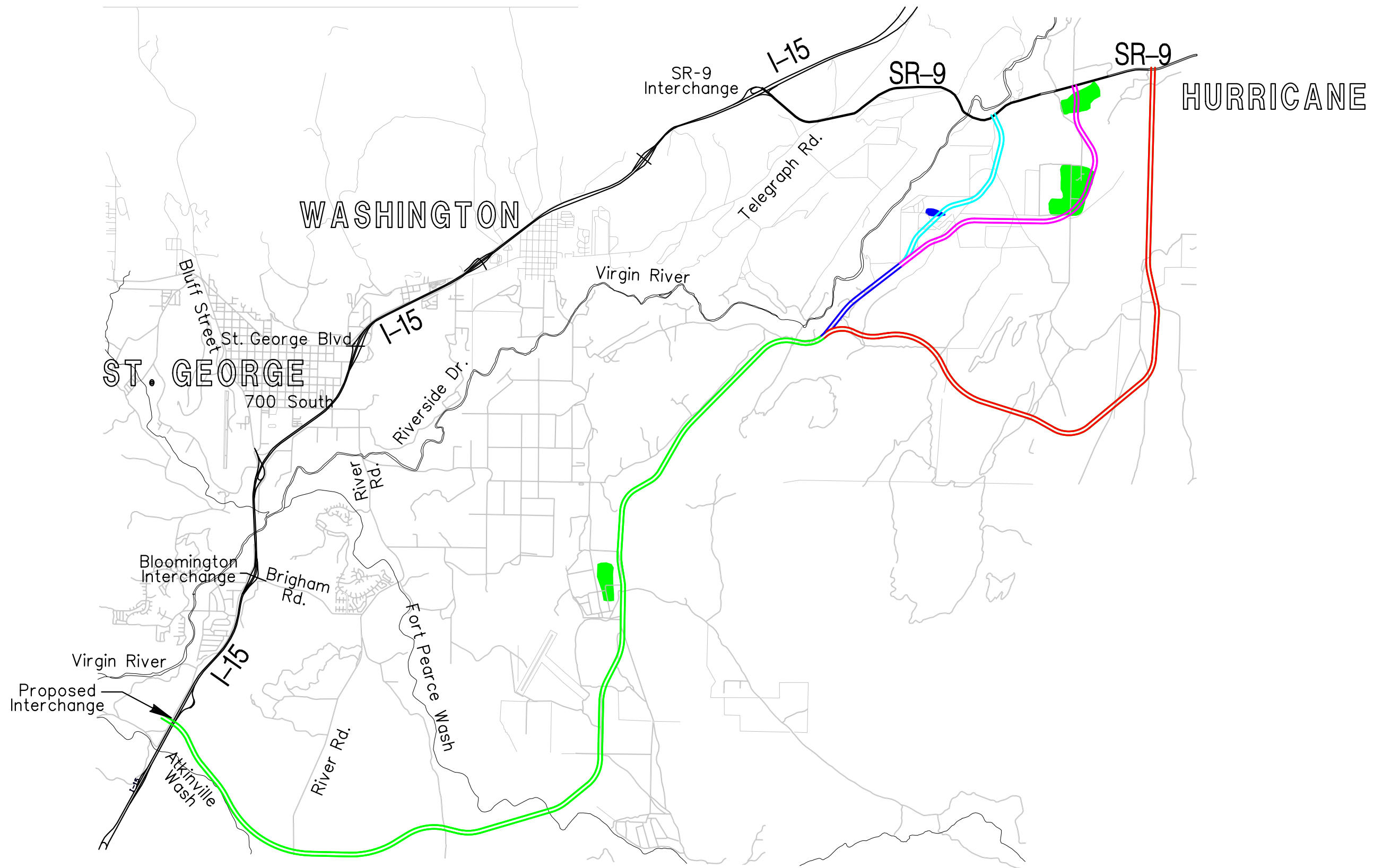


Figure 4-2

HURRICANE CITY FUTURE LAND USE MAP BUILD ALTERNATIVES

Southern Corridor EIS
March 2003



LEGEND

- | | |
|--|---|
| — All Alternatives | Prime Farmland |
| — 4300 West Alternative | Unique Farmland |
| — 3400 West Alternative | |
| — 2800 West Alternative | |
| — 4300 West and 3400 West Alternatives | |

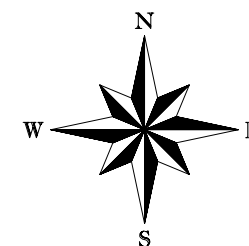
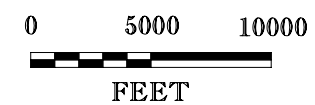
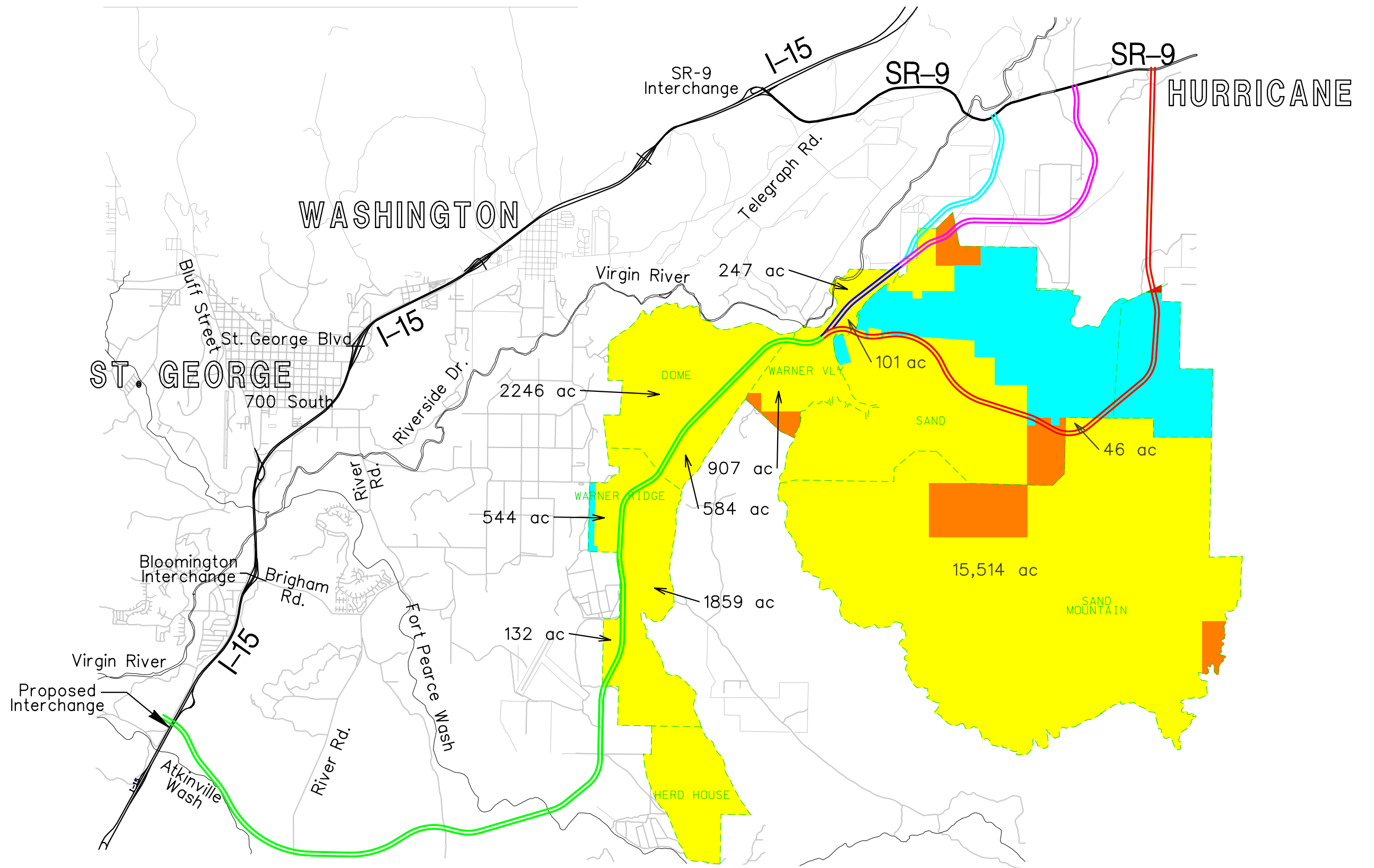


Figure 4-3

PRIME AND UNIQUE FARMLAND IMPACTS

Southern Corridor EIS
March 2003



LEGEND

- State Land
- Private Land
- BLM Land
- All Alternatives
- 4300 West Alternative
- 3400 West Alternative
- 2800 West Alternative
- 4300 West and 3400 West Alternatives

- Grazing Allotment Boundaries
- 132 ac Grazing Allotment Acres*

* Currently the Sand allotment AUMs have been purchased by the WCWCD for the Sand Hollow Reservoir and recreation area and are not used for cattle grazing.

0 5000 10000
FEET

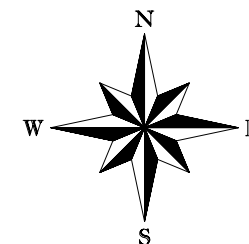
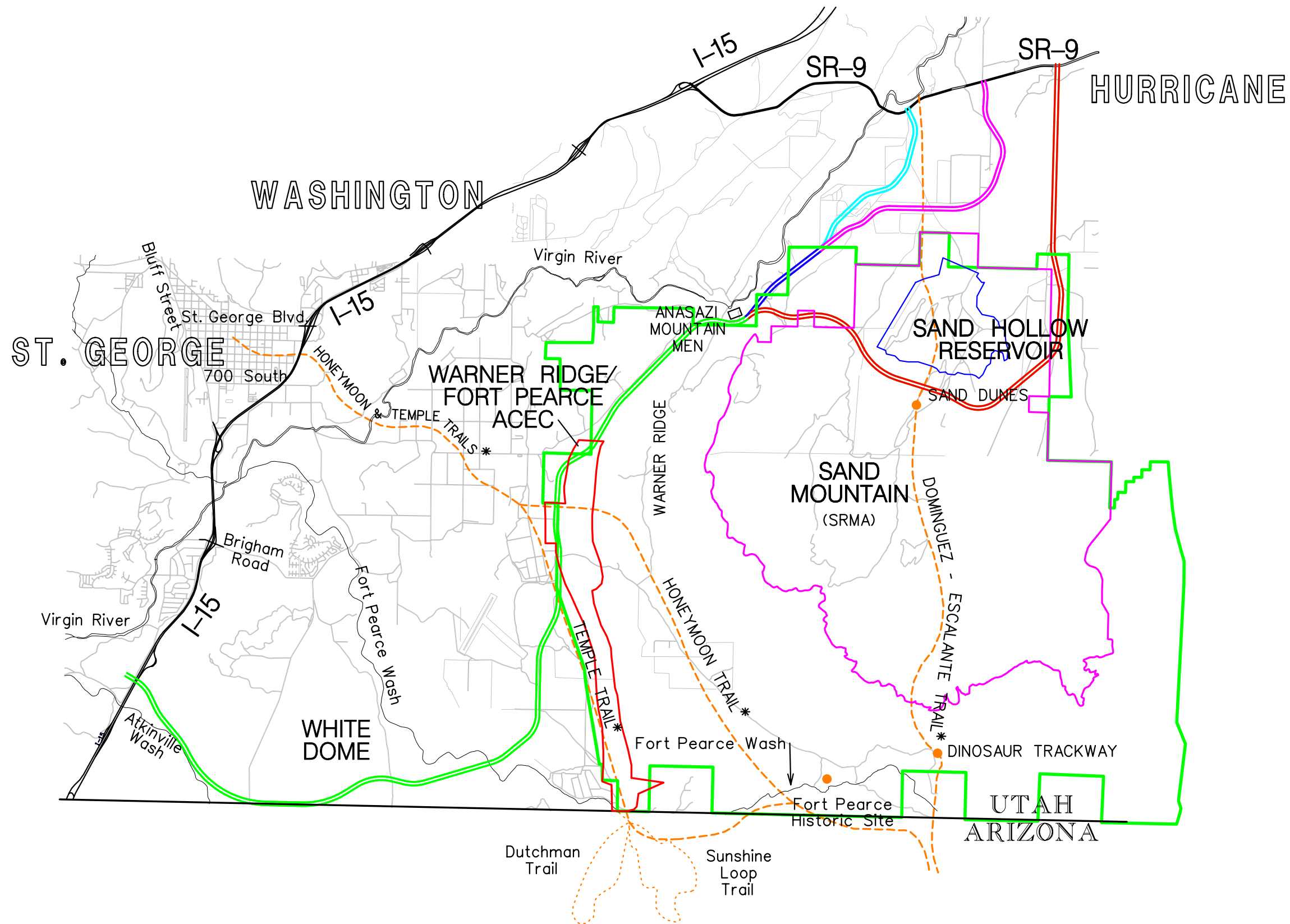


Figure 4-4

POTENTIAL IMPACTS TO GRAZING ALLOTMENTS

Southern Corridor EIS
March 2003



LEGEND

- | | |
|---|--|
| --- Trails * | --- All Alternatives |
| --- Motorized / Non Motorized Trails | --- 4300 West Alternative |
| --- Sand Hollow Reservoir | --- 3400 West Alternative |
| --- Sand Mountain (Special Recreation Management Area) | --- 2800 West Alternative |
| --- Warner Ridge / Fort Pearce ACEC | --- 4300 West and 3400 West Alternatives |
| --- Sand Hollow Recreation Area | |

* Trails are Undefined in the Study Area, Locations are Approximate

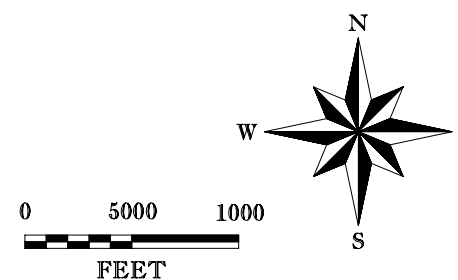
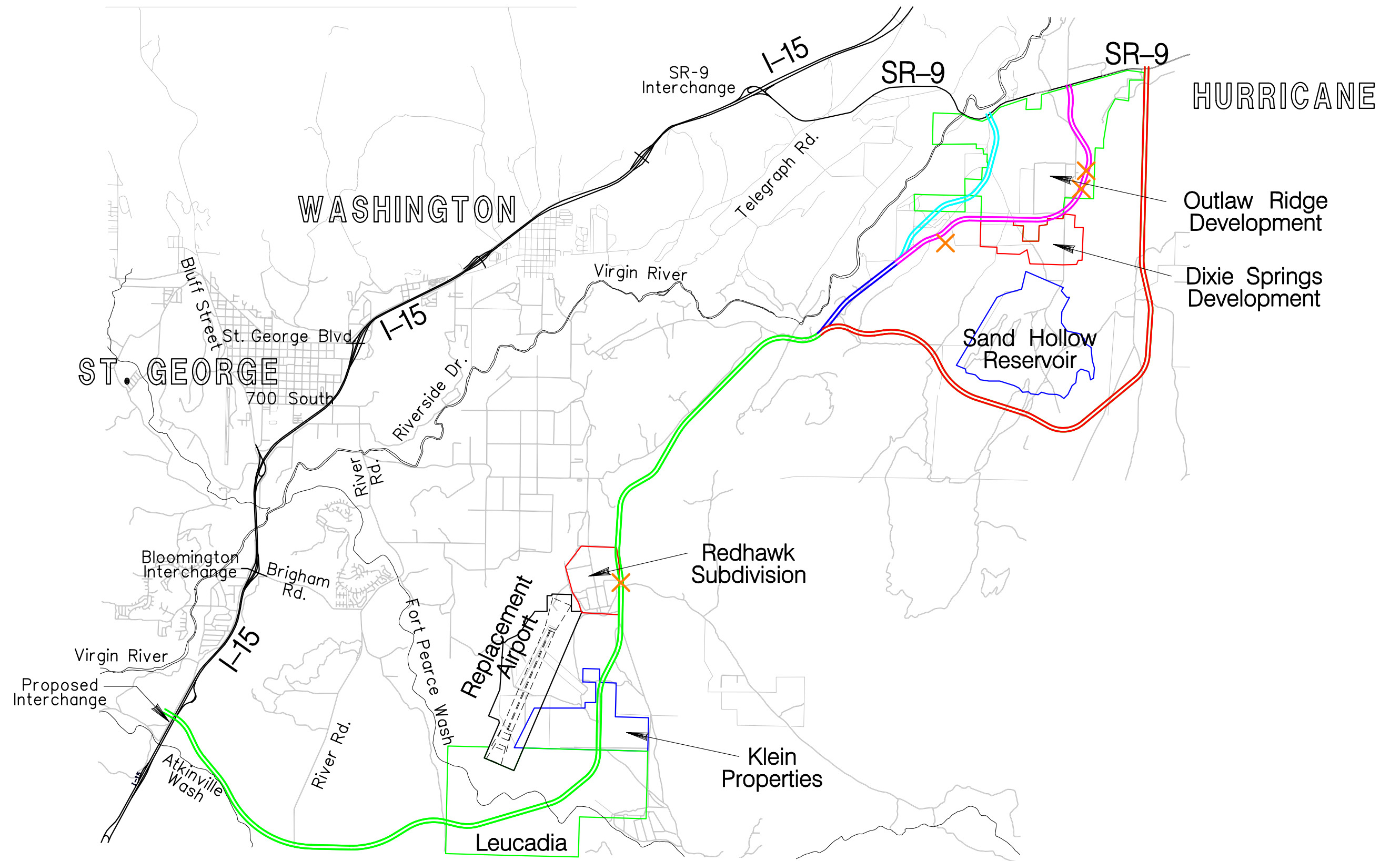


Figure 4-5

RECREATION RESOURCE IMPACTS

Southern Corridor EIS
March 2003



LEGEND

- All Alternatives
- 4300 and 3400 West Alternatives
- 4300 West Alternative
- 3400 West Alternative
- 2800 West Alternative
- X Residential Displacements

0 5000 10000
FEET

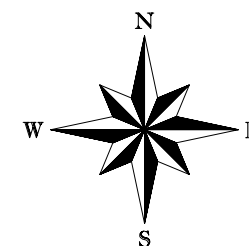
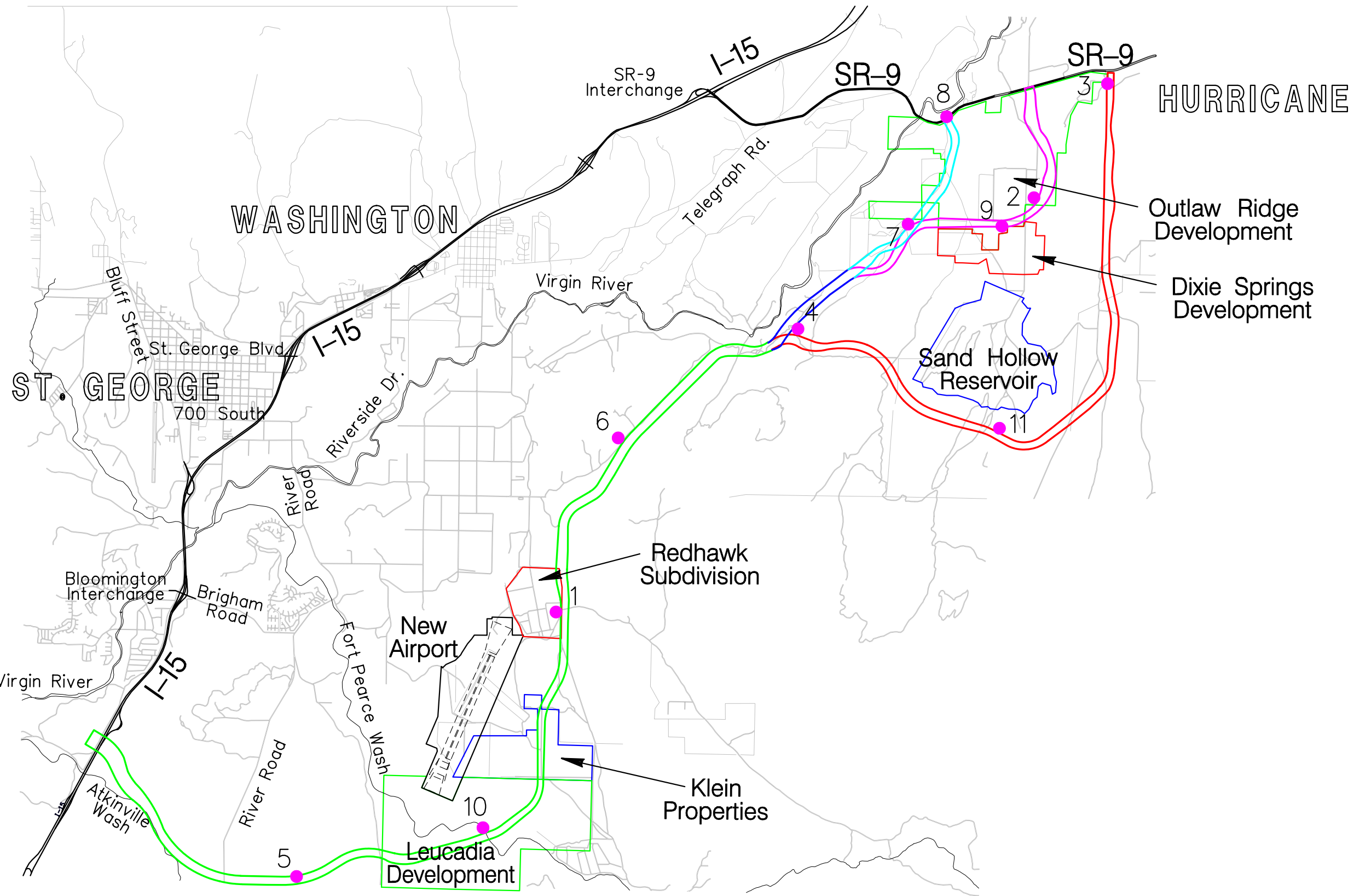


Figure 4-6

POTENTIAL DISPLACEMENTS

Southern Corridor EIS
March 2003



LEGEND

- All Alternatives Noise Contour - 65-dBA
- 4300 West Noise Contour - 65-dBA
- 3400 West Noise Contour - 65-dBA
- 2800 West Noise Contour - 65-dBA
- 4300 West and 3400 West Noise Contour - 65-dBA

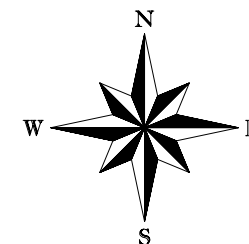
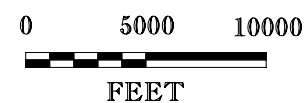
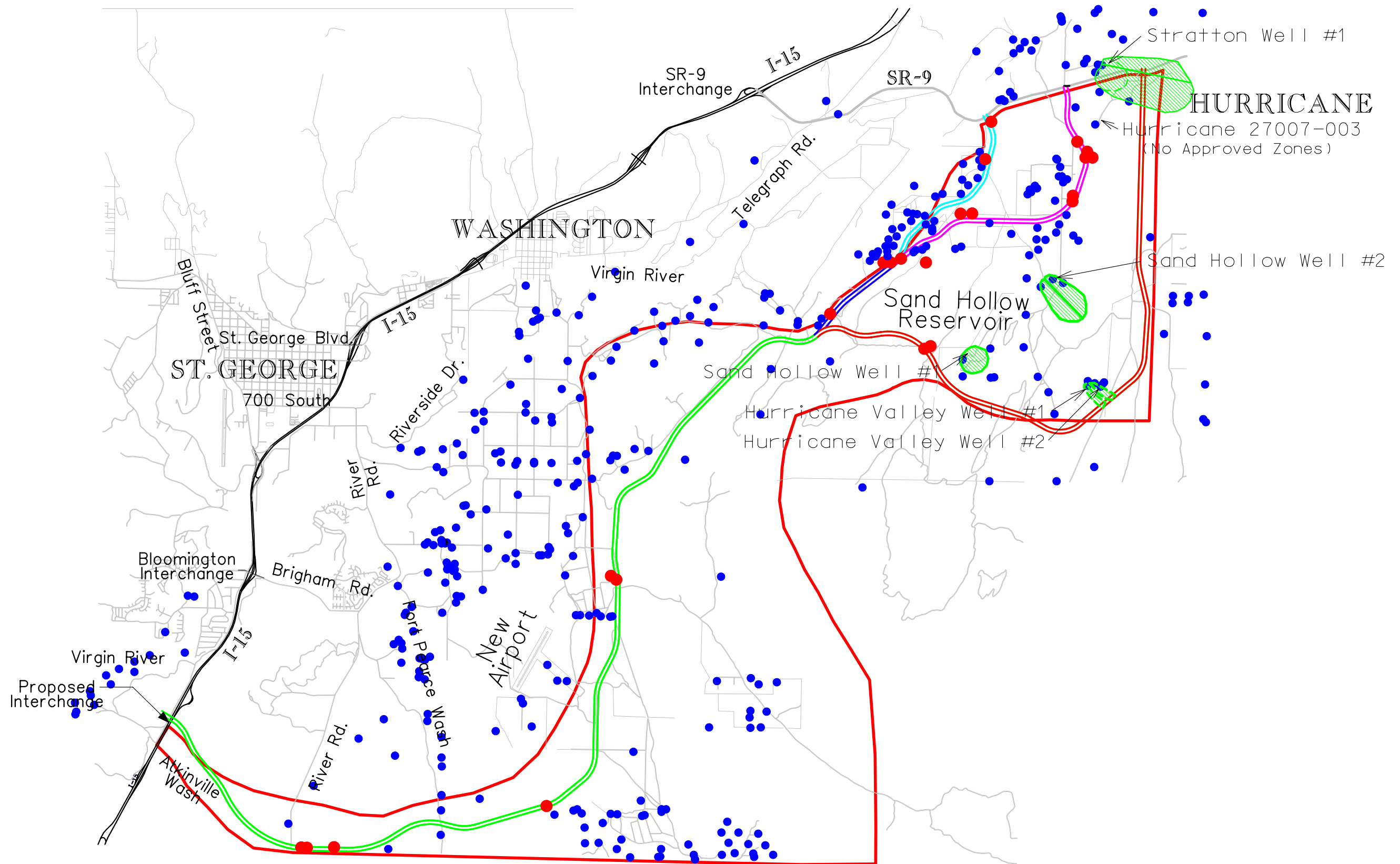


Figure 4-7

SOUTHERN CORRIDOR NOISE CONTOUR LINES

Southern Corridor EIS
March 2003



LEGEND

- Groundwater Wells
- Potentially Impacted Wells
- Wellhead Protection Areas (Zone 4)
- Study Corridor

ALTERNATIVES

- All Alternatives
- 4300 West Alternative
- 3400 West Alternative
- 2800 West Alternative
- 4300 West and 3400 West Alternatives

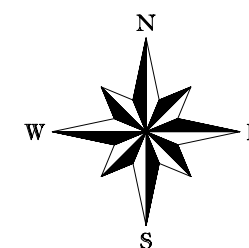
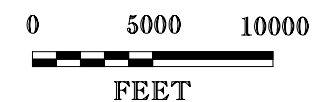


Figure 4-8

POTENTIALLY AFFECTED WELLS

Southern Corridor EIS
March 2003